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Rethinking Careers: Changes in the Structure of Work and the Life Course

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Rethinking careers: Changes in the structure of work and the life course[1]

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1. INTRODUCTION

Work is being restructured in Canada and, indeed, throughout the world. Such restructuring is caused by many factors, including increasingly vigorous initiatives in the private and public sectors to enhance national and global competitiveness. While restructuring takes many different forms, some approaches have a marked effect on the age structure of the workforce,[2] on the allocation of employee work time over the course of the day, week, month or year, and on the structure of the employee's life course. The life courses of employees will vary greatly depending on which restructuring approaches are adopted by their employers. Given the scope of demographic changes that are leading to an aging population and labour force, and the pervasiveness of work restructuring, it is important to determine the extent to which employers and employees are attuned to these changes, take them into account in human resources policies, and adapt to them.

At a time when employers are under increasing pressure to restructure their firms to be more cost-efficient and to improve productivity, the baby boom generation is reaching an age that has led some observers to refer to the "greying" of the labour force. The aging of the labour force is not identical to the aging of the society because not everyone is in the labour force. Over the period 1980-1990, the median age of the labour force rose from 35.4 to 36.5; but the median age of the total Canadian population rose over the period 1981-1991 from 29.6 years to 33.1 years. The fact that the median age of the labour force rose less than that of the population is attributed to increasing early exit from the labour force (National Advisory Council on Aging, 1992: 12).

[2] For example, a company that elects to downsize through attrition accompanied by a hiring freeze will see the average age of its workforce increase, while a company that elects to downsize through early retirement incentives will see the average age of the surviving workforce decrease.

At a broader level, the age structure within a given industrial sector or a given occupational group will vary by economic and technological factors. Thus, slow-growth or shrinking industries will have an age structure that over-represents older workers.

The data reported in this paper come from an intensive case study of NOVA Corporation,[3] a Calgary-based pipeline and petrochemicals firm. As such, NOVA Corporation's economic activities deal with two different industrial sectors.[4] In Canada as a whole, the pipeline transportation industries slightly under-represent older workers, while the chemical and chemical products industries, in which NOVA's Joffre petrochemicals plant is situated, vary only slightly in their age composition from the overall age composition of all Canadian employment (Betcherman and Leckie, 1995).

Within a specific establishment, these demographic issues take life in relation to human resources policies and the options offered to and chosen by employees (Foot and Gibson, 1993: 72). The age structure of a given establishment or company may influence promotion and career progress patterns, with consequent effects on the motivation of workers to remain in or exit from employment in that company or in the labour force (Denton and Spencer, 1987; Foot and Venne, 1990). Age-related abilities, or anxieties about abilities, to adapt to organizational or technological change might similarly have an impact on the age structure of an establishment, or be influenced by that age structure. Health and family concerns of employees may present a very different aggregate picture in an establishment with an older workforce than in one with a younger workforce.

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[3] This is one of seven case studies conducted by the project. Others were based in Sun Life Assurance Company of Canada (Toronto operations), Prudential Life Insurance Company of America (Newark and Philadelphia), the garment industry (clusters of small establishments in Montreal and New York City), Slater Steels (Hamilton), and former Ontario employees of Bell Canada.

[4] Sectors based on the Standard Industrial Classification (1980), as employed by Betcherman and Leckie (1995) in a background paper prepared for the Issues of an Aging Workforce project.

As mentioned previously, emerging patterns of work restructuring and reallocation over the life course are examined in this paper through a case study of NOVA Corporation. A study of its Alberta operations provides extensive data from the management and employee perspectives about existing patterns of working time and new emerging patterns of work over the life course. We first describe NOVA as a changing work organization, in relation to the potential impact of such change on age-related issues of the allocation of working time. Second, we analyse working time at NOVA by comparing two broad groups of full-time employees: permanent employees and contingent employees. Where it is important to do so, we distinguish temporary/casual and contract employees within the contingent employee group. Third, we take a broader approach to working time, focusing on the changing relationship between work and career of NOVA's employees, again building the analysis on a comparison of these two groups. Here we examine the expectations held by employees concerning their careers at NOVA and outside of NOVA. We conclude by examining some emerging research and policy issues.

2. METHODOLOGY OF THE NOVA CASE STUDY

Our case study of NOVA Corporation was restricted to its Alberta operations. We made use of several data gathering techniques. We interviewed 20 key informants, mostly at the senior management and team leader levels, and conducted nine focus groups with 62 participants,[5] gathering a wealth of qualitative data. An Employee Survey was sent to all employees at the Joffre petrochemical manufacturing site and to all field operations employees, but to a one-in-four random sample of Calgary head office employees. We received 1,107 completed questionnaires, for a 75% response rate. In this paper, our analysis of employees is restricted to 1,051 respondents who worked full time.[6] We report on weighted data based on the sampling

[5] We also conducted two sessions of about 25 persons each at a conference of NOVA's Native employees.

[6] We exclude five respondents who described themselves as students, one "gradual retirement" , two "other", and five for whom data are missing on type of job. Because the data are weighted, arithmetical adjustments produce minor differences in the total n. Our working total n of eligible cases is 1051 weighted cases representing NOVA employees, but based on 1044 actual respondents meeting our inclusion criteria for whom we have data on type of job.

design for the employee survey.[7] A separate Manager Survey was completed by 165 managers, for a response rate of 83%. Full personalization techniques and two follow-up mailings were employed to secure these high response rates.[8] A full description of the methodology is provided in the case study report (Centre for Studies of Aging, 1996).

Later in the paper we compare permanent with contingent full-time employees (the operationalization of this distinction is given in Section 4.1 below). Table 1 shows the age and gender distribution of the permanent and contingent employees in the weighted sample as defined for this paper.

The age distribution of permanent employees reflects a traditional population pyramid, except that reduced hiring of permanent employees in recent years has seen this pyramid pinched in at the bottom, leaving a diamond-shaped age structure. Contingent employees continue to be hired and their age distribution reflects a broadly-based pyramid (where the lowest age group is the largest group) but with a slight bulge out in the highest age group. The gender distribution is 72% (n=751) males and 28% (n=296) females. In this paper we will not discuss differences across the three major work settings in our study, but we should note that the Joffre petrochemical site has a higher proportion of male employees (over three-quarters) than NOVA as a whole. Another unique aspect of Joffre is the existence of a cohort of workers that began working together at the beginning of their careers (i.e., in their early 20's) and who are now aging together. The age and gender distributions of the field sites are similar to the Joffre distributions. A large proportion of men at the field sites reflects the traditionally male-oriented work done at

[7] This is the weighted total. We apply weighting adjustments to compensate for the sampling design. The only weighting we applied was to compensate for the 4:1 sampling ratio; we did not weight for response rate differentials or any other factor.

[8] To enhance the response rate we also arranged for a story about the study to appear in a NOVA employee newsletter, NOVA NOW. The mailing of the survey was conducted through NOVA's corporate distribution system but questionnaires were returned directly to the project office in Toronto. Identification numbers were used to protect respondent confidentiality.

these remote sites. There are also fewer young people working in the field sites. although the proportion of women is somewhat greater than at Joffre.

Table 1

Age and Gender Distributions of Permanent and Contingent Employees
(NOVA Employee Survey,* Weighted Data)

Age Range	Permanent Employees		Contingent Employees		Total Sample	
	Male %	Female %	Male %	Female %	Male %	Female %
50+ years	14	9	18	9	15	9
45-49 years	17	15	2	6	15	14
40-44 years	19	13	17	3	18	11
35-39 years	25	22	14	9	17	19
30-34 years	19	20	10	19	18	20
< 30 years	7	21	39	54	11	27
Total n	644	232	87	53	738	289

* Excludes part-time employees, five students, one "gradual retirement" and two "other".

Looking now at NOVA as a whole, the average age for the employee sample is 38.9 years (sd=9.08) with a median age of 38. The average age of permanent employees is 39.6 (sd=8.52; median=38); that of contingent employees is 34.5 (sd=11.04; median=33). Men are, on average, older than women (men: mean=39.8, sd=8.90, median=39; women: mean=36.4, sd=9.07, median=35).

NOVA's workforce is highly trained. One quarter of its employees have had vocational/technical training (25%, n=252), and another quarter hold an undergraduate degree (25%, n=255). Employees 45 and older are generally less educated than younger employees.

3. NOVA AS A CHANGING ORGANIZATION

Of all the seven case studies in the **Issues of an Aging Workforce** program of research, NOVA Corporation was undergoing the most profound organizational changes. Part of these changes reflect NOVA's responses to trends in its two businesses -- pipelines and petrochemicals manufacturing. Other changes relate to trends that are occurring in corporations generally, such as:

- refocusing on core competencies;
- increasing use of technology;
- organizational restructuring (called Business Transformation at NOVA);
- greater use of employee teams;
- implementation of a shared leadership that rewards alignment with organizational goals and objectives (called People Leadership at NOVA);
- moving towards a flexible workforce or core, term and contract workers under the "Shamrock" approach to human resourcing;
- employee self-management by objectives (called SMBO/RIO at NOVA); and
- use of the Balanced Scorecard, which attempts to balance the interests of customers, employees and society.

The scope of change at NOVA is reflected by the fact that at the end of 1981, the corporation had an annual net income of $130 million and employed almost 10,000 people. In 1995, NOVA had $4.4 billion in revenue and $702 million in income with assets totalling $9.2 billion. By the same year, NOVA had reduced its workforce to 5,700 employees, 4,300 of whom were in Alberta. The Business Transformation process, which was initiated in 1993 by J.E. (Ted) Newall, NOVA's Chief Executive Officer, involves employee teams in every area of the company. The teams are looking at what is being done, how it is being done and why it is being

done and restructuring work processes, business units or departments to align them with NOVA's business growth opportunities.

If a particular process or service is not deemed to be strategic or closely aligned with NOVA's business growth opportunities, it is evaluated for outsourcing to an external provider under a procedure known as Resource Analysis. Such organizational restructuring can have a major effect on employees. For example, at NOVA Gas Transmission Limited (NGTL), new, redesigned work processes resulted in internal postings of 450 jobs in January 1995. Employees were allowed to apply for positions using an electronic Position of Preference or POP form.

The company news magazine NOVA NOW reported in March 1995 that recent Business Transformation initiatives were expected to make approximately 125 employees eligible for the options in the Employee Transition & Continuity (ET&C) program. This program is offered to employees who are not placed in the restructured positions. The various options, which are designed to be age neutral, include severance payout, early retirement, work in the community, or funding to start a new business or return to school. Personal and financial counselling is made available to all NOVA employees through the Career Resource Centres and a variety of career development courses are offered. Employees are encouraged to take a positive view of workplace changes as the following quote from the NOVA NOW magazine of June 1995 suggests:

> *When one door closes another door opens; but sometimes we often look so long and so regretfully upon the closed door that we do not see the ones which open for us.*
>
> *Alexander Graham Bell*

Another article in the June 1995 issue of NOVA NOW reflects the company's attempt to change their expectations of working time in the company. The article entitled, "Take charge of your career with the Career Resource Centres" emphasizes that the expectation of continuing change at NOVA makes it unlikely that employees can depend on lifetime employment. Instead, employees are told to "invest in themselves" and to make themselves as marketable as possible

for the new, flexible workforce. A framed quote from CEO Ted Newall in the Career Resource Centres captures the idea:

> *Whether you continue to build your career with NOVA, or choose another career, now is the ideal time to carefully reflect on your future.*
>
> *Ted Newall*

The Career Resource Centres offer 10 different workshops including one called, "Life is a highway (and you're in the driver's seat)". The program operates like a board game and is played with a partner. It provides the employee with the opportunity to try out their reactions to workplace and career changes in a simulated environment.

During 1995 and early 1996, 249 employees left NOVA under the ET&C program. The various options chosen are shown in Table 2. It is notable that the most popular for all three age groups is the entrepreneurial option in which employees with a viable business plan are given severance and a grant of up to $25,000 towards the purchase of their own business. Younger workers are more likely to take the skills upgrading, education or relocation options than are older workers. The community support option, in which employees can take a leave to work with a community-based, non-profit organization and be paid 50% of their current salary, was selected by about 6% of all age groups. Workers over age 45 are much more likely to take the severance payout or early retirement option than middle aged or younger workers.

Even though NOVA's ET&C program is designed to be age neutral, older workers are more likely to be in the program than younger workers. As shown in Figure 1, workers over 45 represent 26% of the employee population studied; however, they represent 40% of the ET&C'ed workers. In contrast, middle-aged and younger workers are proportionally under-represented. Perhaps older workers are more likely to be considered appropriate candidates for ET&C by those in decision making situations or by the older employees themselves, even in an environment like NOVA that makes efforts to take an age neutral approach. Offering early

retirement packages is usually one of the first strategies selected by organizations that are downsizing and this pattern may be reflected in the NOVA findings.

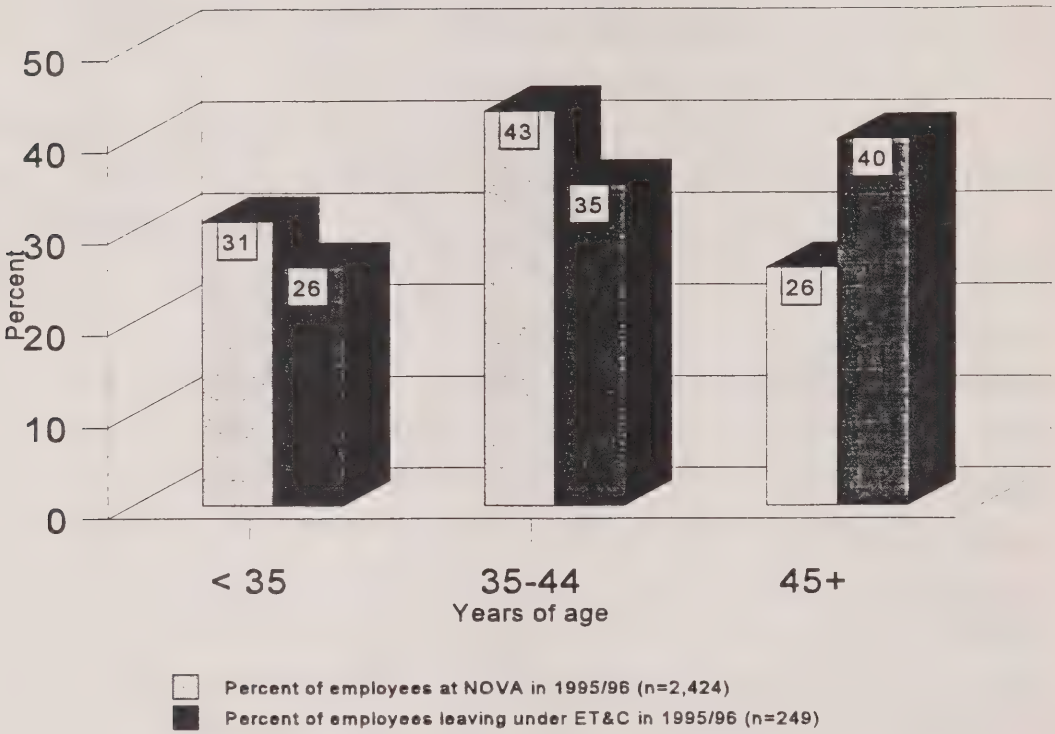
Table 2

Selected ET&C Options by Age Group

(NOVA Human Resources Data; n=249)

	<35 years %	35 - 44 years %	45+ years %
Entrepreneurial	42	52	47
Skills upgrading	13	4	0
Relocation	11	4	2
Community Support	6	6	7
Education Leave	13	8	1
Leave of Absence	3	0	1
Severance/Early Retirement	14	27	42
Total n	64	86	99

Figure 1. Age Patterns of Employment in 1995 and Selection for Downsizing through ET&C



Change at NOVA is also evident in hiring practices. As shown in Table 3, the proportion of permanent full-time employees hired has declined since 1987, whereas temporary full-time and co-op students and others has increased dramatically. These patterns are in keeping with NOVA's overall approach of developing a flexible workforce that can respond to changing business needs. In the past, student jobs have often provided entry into permanent full-time positions in organizations; however, these data suggest that this pattern may be changing. Together, the findings regarding the greater number of older employees in the ET&C program and the fewer number of permanent, full-time hires suggest that workers at either end of their career paths are being affected more than are those workers in the middle.

Table 3

New Hires: 1987, 1990, & 1994 by Type of Employment

(NOVA Human Resources Data)

	Permanent Full-time n (%)	Temporary Full-time n (%)	Permanent Part-time n (%)	Temporary Part-time n (%)	Co-op Students & others n (%)	Total n
1987	223 (97)	2 (1)	2 (1)	0 (0)	3 (1)	230
1990	509 (92)	9 (2)	34 (6)	2 (0)	0 (0)	554
1994	65 (8)	253 (33)	1 (0)	43 (6)	414 (53)	776

3.1 Managers' Perspectives

Respondents to our Manager Questionnaire think that NOVA employees have been affected in a major way by the changes occurring in the company (i.e. 86%, n=139, somewhat or strongly disagree with the statement that NOVA employees "have not been affected in a major way by organizational change and restructuring"). Almost all of the managers (93%, n=150) strongly or somewhat agree that employees no longer think of working at NOVA as a lifetime job. Similarly, 95% (n=154) strongly or somewhat agree that employees have to work longer and harder to keep NOVA competitive in the current environment.

Half of the managers (51%, n=83) strongly or somewhat agree that employees are generally positive about the changes. When asked about the effect of restructuring on older workers in particular, almost half (47%, n=78) think that restructuring will be disadvantageous to older workers, 38% are neutral on the issue and 13% think that it will be advantageous. The major reasons listed by managers for the perceived disadvantage are the difficulties that older workers may have in adjusting to major change (21%, n=34) and possible pressures on older workers to leave early (11%, n=18). Since we did not ask a comparison question about the potential disadvantage of restructuring for younger workers, we cannot assume that younger

workers are perceived as less disadvantaged than older workers. In fact, our general impression was that restructuring, although seen as being in the best interests of the company by the majority of employees, was also seen as being very tough on employees of all ages. Older workers may, however, be especially vulnerable in the current climate because of the perception that they are in a better position than middle aged workers to take an early exit package.

In the research, an older worker was arbitrarily defined as someone aged 50 or over, but we were curious to know whether NOVA managers agreed with this definition. While 48% (n=77) did so, 51% of the managers did not. The mean age at which managers consider someone to be an older worker is 53.3 (sd=5.55; median=50).[9] We asked the same question on our Employee questionnaire. The average age at which employees consider someone to be an older worker is 51.9 (sd=5.21, median=50); permanent and contingent workers do not differ in this judgment.

When we began this research in 1993, the trend towards downsizing and flexibility in the workforce was less evident. In fact, one of the major human resources trends being discussed at the time was the aging of the workforce and the possibility of a labour force shortage. As a result, a number of our survey questions investigated managers' awareness of the aging workforce issues as well as possible plans to introduce various incentives to **retain** older workers. We were also interested in attitudes towards older workers, since negative attitudes could limit the opportunities of older workers to stay in the workforce even though they were needed.

Almost half of NOVA managers (44%, n=68) say that recruitment and retention of older workers is not yet a concern at NOVA and 17% (n=27) say that, although they see it as a possible concern, no plans to deal with it have yet been formulated. After our study was completed, the March 1996 issue of NOVA NOW reported that phased retirement is one of a number of options

[9] For those individuals who agreed with our definition of an older worker, we imputed the value of 50, the age we defined as older worker, and included these individuals in the computation of the average. We followed this procedure for both employees and managers.

being considered by the Alternative Work Arrangement Team headed by Arnie Wensky, NOVA's Practice Leader, Employee Relations. The article points out that phased retirement is not yet a common practice, which is consistent with findings of the earlier Workforce 2000 survey undertaken by Towers Perrin (1991).

In general, managers' attitudes towards older workers at NOVA are very positive. Most of the managers think that older workers are productive employees. Responses to specific items related to working time are shown in Table 4.

Table 4

Managers' Perspectives on Older Workers

(NOVA Manager Survey)

Indicate your agreement or disagreement with each of the following statements. Older employees ...	Agree** %	Unsure %	Disagree** %	Total n*
Are marking time until retirement	16	14	71	156
Are productive employees	97	1	1	156
Cannot adapt to new technology	31	9	60	158
Have difficulty working overtime	22	34	44	158
Have difficulty with extended work schedules	31	40	29	157
Have trouble with shiftwork	34	57	9	158
Want to be retrained for non-shiftwork	23	72	5	165

* Percentages may not add to 100 due to rounding; n's vary due to missing values.

** We collapse the "agree strongly" and "agree slightly" categories, and the comparable "disagree" categories. As noted, the Manager Survey, unlike the Employee Survey, allowed a "not sure" category. On many items, managers expressed being "unsure", and it is likely that some responses on the Employee Survey would have been "unsure" had this response option been open to them.

In general, managers have few reservations about older workers productivity and their ability to adapt to different time regimens. The two items dealing with shiftwork require explanation. Most NOVA managers have no direct experience with shiftworkers; hence the large percentage of "unsure" responses to these items. In addition, it may be noted that some time prior to the survey, a consultant had conveyed some mis-information to management at Joffre concerning the ability of older workers to adapt to shiftwork. Therefore, the percentage of managers expressing such concern might have been increased by this mis-information.

Another insight regarding the perceptions of older workers at NOVA is provided by managers' responses to questions about maximum recruitment age. Some 43% of the managers say that no age is too old for someone to be recruited as a NOVA employee; however, another 43% provide an age at which an employee is too old to hire. Younger ages are estimated for recruitment into shiftwork. These results are shown in Table 5.

Table 5

"What age is too old for recruitment?"

(NOVA Manager Survey)

	All jobs at NOVA	Shiftwork jobs only
Age	Cumulative %	Cumulative %
45	9	31
50	20	51
55	41	79
60	77	93
Total n	70	71

In summary, NOVA managers are generally quite favourable in their attitudes towards older workers, but they do express some concerns that relate to time use. Specifically, they express concern about the suitability of older employees for shiftwork.

3.2 Employee Perspectives

The Employee Questionnaire also includes a series of 12 items regarding attitudes towards older workers. Although the response categories differ slightly and there are fewer working time items included on the Employee Questionnaire, positive attitudes towards older employees are still evident as shown in Table 6.

Table 6

Employees' Perspectives on Older Workers

(NOVA Employee Survey, Weighted Data)

Indicate your agreement or disagreement with each of the following statements:	Strongly Agree %	Slightly Agree %	Slightly Disagree %	Strongly Disagree %	Total n*
Are marking time until retirement	5	33	40	23	981
Are productive employees	45	48	7	0	1005
Cannot adapt to new technology	5	34	41	20	1009
Have trouble with shiftwork	8	49	35	9	876

* Percentages may not add to 100 due to rounding; n's vary due to missing value; excludes part-time, students, gradual retirement and "other" employees.

NOVA employees, like managers, express positive views of older workers, and see them as productive. The items, "Older workers cannot adapt to new technology" and "Older workers are marking time until retirement", was endorsed by almost forty percent of employees. Both managers and employees hold similar opinions regarding employees ability to adapt to new

technology. The proportion of respondents on the employee survey agreeing that older workers are marking time until retirement was higher than was seen on the managers survey. This may be due partially to the differing response format and a trend that was noticed in the NOVA case study report where older respondents were less likely to hold negative views of older workers compared to younger respondents. Since the manager sample is significantly older than the employee sample it is not surprising to find somewhat more positive views toward older workers expressed by managers; although, in general, the responses of employees was quite similar to that of managers. Some respondents on both the manager and employee surveys expressed reservations about shiftwork and about the ability to adapt to new technology.[10] Quite a large proportion of employees also expressed concern that employees were marking time until retirement.

4. CONCERNS ABOUT WORKING TIME AT NOVA

The Alternative Work Arrangement Team is exploring the following alternative work arrangements according to the March 1996 issue of NOVA NOW: job sharing, telework, mobile worker, variable hours, compressed work week, virtual office and phased retirement. During our study, the primary working time concerns that we observed at NOVA related primarily to concern about aging shiftworkers and the change in working time implicit in the move towards a flexible workforce (and away from the notion of a lifetime career in the company). There were also some concerns regarding the effect of extended work schedules which include overtime, working an extended work day (e.g. 12 hour shifts) and working more than seven days in a row. The latter experience occurs mostly with field workers at remote sites.

Since NOVA has attempted to take an age neutral approach to restructuring and since there is a general concern with retaining the expertise of older, more experienced workers, the

[10] Older employees were more positive than younger employees on these and other attitudinal items; however, it should be emphasized that the general pattern of responses suggests quite positive attitudes toward older workers. This issue is explored in detail in the case study report.

notion of working time is also of interest as it relates to retirement and early exit from the workforce. Our data provide an opportunity to compare the working time experience and attitudes of members of the permanent and contingent (i.e., the temporary/casual or contract workforce) at NOVA. The following discussion will focus on such a comparison.

4.1 The Distinction Between Permanent and Contingent Employees

In our Employee Survey we began by asking respondents to describe their current job as full time or part time (less than 30 hours per week). Ninety-seven percent of the respondents described their job as full time, and we confine our analysis to these employees. A second question asked all respondents whether their job was a *permanent*, *part-year* (9 or fewer months of work), *temporary/casual* (it could end any time), *contract* (you were contracted for a specific period of time), or "*other*" kind of job. For this analysis we contrast permanent with other employees, whom we label as "contingent". The dichotomy has 86.1% (n=905) permanent employees and 13.9% (n=146) contingent employees in the weighted sample. Of the latter, one-quarter (25%, n=37) are temporary/casual or part-year, and two-thirds (63%, n=92) are contract employees.[11] Since our sample was based on the Corporate Directory, it is likely that there were other contract employees who were working directly or indirectly for NOVA who were not included in our study. The data gathered provide an opportunity to take an exploratory look at differences between these two types of workers.

Our major analytical concern is to examine the extent to which working time is organized differently for permanent and contingent workers.

[11] This includes 92 respondents who said they held a "contract job", 3 who held a contract under the Employee Transition and Continuity Program, 3 who said they held "external contracts". Weighted data.

4.2 Hours worked

We did not ask all respondents to the Employee Survey[12] a direct question on how many hours they worked. We asked, "Does your job routinely involve extended work hours?". and 45% said that it did. For the others, we impute the value of the number of hours defined by NOVA as a standard work week. This is 40 hours. For those who said they did work extended work hours, we asked, "How many hours do you work at NOVA in a typical week?". For these respondents we use their exact answer to this question. On this basis, we can compare permanent and contingent workers, as shown in Table 7.

Table 7

Hours Worked by Permanent and Contingent Employees

(Employee Survey, * Weighted Data)

	Permanent Employees	Contingent Employees	p value
Percent Working Extended Hours	47	27	<.001
Mean Hours Worked (sd, median)	42.6 (5.18, 40)	41.5 (4.98, 40)	<.05
Percent Working Overtime	85	89	ns
Percent Working Extended Day (e.g., 12 Hours Shifts)	33	30	ns
Percent Working More than Seven Days in a Row	14	12	ns
Percent Working at More than One Job for Pay	4	12	<.001

* Excludes part-time employees, students, gradual retirement and "other" employees.

[12] We did not ask managers about hours worked.

Although permanent workers are much more likely to work extended hours, the actual difference in the number of hours worked is not great. However, because contingent workers are more likely to be working at more than one job for pay, many of them probably work longer hours per week than do permanent employees.

4.3 Shiftwork

About one in ten NOVA employees are on shiftwork. Most of these are at the Joffre petrochemical manufacturing plant. Another small group works in the "Bunker" in Calgary, monitoring the flow of gas through NOVA's pipelines. We have analysed shiftwork at Joffre in detail elsewhere (Centre for Studies of Aging, 1996, ch.10). Here we do not disaggregate the data by work site. There is a tendency for permanent employees to be more likely to work shifts than contingent workers (11% vs 7%) and, in fact, in our sample only 10 contingent workers work shift.

4.4 New forms of work organization

New forms of work organization related to working time that were explored in the NOVA case study include flexible work schedules, alternative work arrangements, job sharing, job rotation, downsizing, business transformation, re-engineering, management delayering, and contracting out. Table 8 compares the effects of these forms of work organization as perceived by permanent and contingent workers.

Table 8

Reported Effects of Organizational Change

(Employee Survey,* Weighted Data)

What kind of effect have the following work arrangements had on you personally?	Percent Reporting Positive Effect			
	Permanent %	Contingent %	Total %	p value
Flexible Work Schedules	96	97	96	ns
Alternative Work Arrangements	79	85	80	ns
Job Sharing	73	65	72	ns
Job Rotation	83	59	81	<.01
Downsizing	22	21	22	ns
Organizational Restructuring (Business Transformation and Implementation)	43	33	41	<.10
Re-engineering	49	38	48	<.10
Management Delayering	74	36	70	<.001
Contracting Out	48	65	51	<.01

* Excludes part-time employees, students, gradual retirement and "other" employees. "Positive" includes moderately and strongly positive. "Not sure" and "Does not apply to me" were excluded.

The first three work arrangements described in Table 8 deal with the scheduling of work time. Although there are no differences between permanent and contingent employees concerning these items, it should be noted that substantial proportions of all workers favour arrangements that provide different forms of flexibility to them. Job rotation is more often favoured by permanent employees than contingent employees, probably because it provides a means for permanent employees to enhance their human capital and career chances within the company. Contingent employees do not have such long-range career opportunities at NOVA.

The next four items deal with various restructuring programs currently being implemented at NOVA, and these receive varying degrees of support from NOVA employees. Most permanent employees feel that management delayering has had a positive effect on them personally. They are less likely to feel they have benefitted personally from re-engineering, organizational restructuring, and downsizing. Contingent employees feel the same as permanent employees about downsizing -- most employees feel that it has had a negative effect on them personally. Not surprisingly, given the time- and job-limited nature of their relationship to NOVA, contingent employees are less likely to report experiencing a positive effect from organizational restructuring , re-engineering, and management delayering. It is also not surprising that contingent employees, mostly under contract, feel they have benefitted by NOVA's policy of increasing its reliance on contract workers. What may be surprising is that almost half of permanent workers also feel that they have been positively affected by NOVA's turn towards contracting out.

5. CHANGING CONCEPTIONS OF CAREER

We have discussed a number of organizational factors affecting the structure of working time of permanent and contingent workers. We now turn to the broader temporal aspects of their working lives and the nature of their careers. We are interested in the nature of these careers as experienced by NOVA employees so far, and in their expectations for the future. Evidence that employees have internalized the organizational changes at NOVA by re-evaluating their conception of a career emerged from focus groups. For example, one younger male employee stated:

> I certainly don't entertain any notions about being with NOVA for thirty years. I don't think that's realistic. I think that it's going to be up to me to create my own employment.

The average permanent employee at NOVA has been with NOVA for 9.6 years (sd=6.06, median=8). He or she has held 3.1 different jobs at NOVA (sd=2.12, median=3); and 4.27 jobs in

their entire working career (sd=3.77, median=4). Contingent employees have been with NOVA, on average, only 2.92 years (sd=4.16, median=1); and they have had only 1.84 different jobs at NOVA (sd=1.38, median=1). They have had more jobs in their lifetime than have permanent employees at NOVA, with an average of 5.98 jobs (sd=7.37, median=4). [13]

We asked employees if their current job at NOVA was a result of a promotion, a lateral move, a redefinition of their previous job, or if it was the first job held. The responses to these questions are presented for permanent and contingent employees in Table 9.

Table 9

"Was this job a result of..."

(Employee Survey,* Weighted Data)

Was this job a result of ...	Permanent %	Contingent %	Total %
A promotion	22	5	20
A lateral move**	32	5	28
A redefinition	17	12	16
This was my first job at this company	29	66	34
Contract	---	12	2
Total n	879	134	1013

* Excludes part-time employees, students, gradual retirement and "other" employees.
** Includes 9 demotions.

At NOVA, lateral moves and redefinitions of jobs are more likely to be the basis for the current job than in many companies -- more so than in three other companies studied in our

[13] All differences noted in this paragraph are statistically significant, $p<.001$.

research program. Promotions are fewer than in many companies.[14] And at NOVA promotions are the privilege of the permanent employee. However, in the context of substantial business transformation at NOVA, many permanent employees are seeing their jobs redefined, or being moved laterally rather than up. That two-thirds of contingent employees say that this is their first job at NOVA suggests that NOVA is contracting with a broadly based labour pool of contingent workers in Alberta, rather than predominately shifting workers from permanent to contingent status.

Another way to examine career trajectories is to ask employees about their entire job histories (in this case, including jobs held prior to NOVA). Permanent and contingent employees report very different job histories, as noted in Table 10.

Table 10

Job History of Permanent and Contingent Employees

(Employee Survey,* Weighted Data)

In general, would you describe your total job history so far as ...	Permanent %	Contingent %	Total %
Two or more jobs moving up an organization	22	17	21
Two or more jobs, moving both up and across an organization	52	47	52
Two or more jobs, moving down and across an organization	15	7	14
Few, if any, job moves	11	29	13
Total n	813	120	933

* Excludes part-time employees, students, gradual retirement and "other" employees; 83 "don't know" and 35 "missing data" were also excluded.

[14] For example, 46% of Sun Life Insurance Company employees, and 33% of Slater Steels employees surveyed in similar case studies we conducted said they had attained their current job through a promotion versus 20% at NOVA.

As noted earlier, contingent employees are more likely than permanent employees to be in their first job, and their job history suggests fewer moves. This is confirmed by the data in Table 10. Otherwise, there are few discernible and no strong differences between permanent and contingent employees on this indicator of career mobility.

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We now turn to the ways in which NOVA employees envision their futures. As seen in Table 11, contingent employees do not anticipate a long-term future with NOVA. They anticipate self-employment or contacting their services to other companies of which NOVA is one. Almost one-third see some form of continuing relationship with NOVA. However, more than half the permanent employees anticipate remaining at NOVA, although with little job mobility.

Table 11

Thinking of your own future...

(Employee Survey,* Weighted Data)

Thinking of your own future, do you anticipate that you will...	Permanent %	Contingent %	Total Sample %
remain in the same job at NOVA for the rest of your working life	10	3	9
move to a different type of job at NOVA	45	14	41
move to a job with a different company	11	23	12
contract your services to NOVA	1	13	3
go into business for yourself	12	25	14
Don't Know	21	22	21
Total n	901	145	1047

* Excludes part-time employees, students, gradual retirement and "other" employees.

Retirement represents the end of the traditional working career. We asked employees, "At what age do you expect to retire?". Despite differences in the mobility experiences at NOVA, somewhat different job histories, and widely divergent anticipated work careers, permanent and contingent employees anticipate leaving the labour force at the same age. The average age of expected retirement is 58 for both.

6. EMERGING ISSUES

A number of research and policy issues emerge from our observations of working time at NOVA Corporation. We have observed that demographic trends influencing the age structure of the labour force play a role in shaping the age structure of firms. However, the major thrust of this paper has been to emphasize the role that firms play in shaping their own age structure and, derivably, having an impact on the lives of the population. Demography is not the main "driver" of the pattern we have described, in which a polarization of employment between permanent and contingent workers is found in companies that heretofore relied more firmly on providing long-term career security to a stable core of employees.

Since NOVA has only recently begun contracting out what it considers to be non-core activities, many questions remain about the long-term impact of having permanent and contingency workers in the same workforce. Our preliminary analyses in this paper have shown significant differences in the attitudes and experiences of these two types of workers and it will be important to study this situation further as the structure of workforce changes.

A second important question that is beyond the scope of our study relates to the experience of those employees who leave NOVA through the Employee Transition & Continuity Program under the various options available. NOVA has invested heavily in its Career Resource Centres in the hope that it will better prepare employees for the new world of work. Questions arise as to how successful these programs are and to what extent workers are able to adapt to the new forms of career that are being suggested. In particular, there is concern that older workers

age 45 to 55 who leave under these circumstances will find it especially difficult to adapt successfully. Such concerns may have prompted half of the NOVA managers to indicate that older workers were likely to be disadvantaged in the current environment.

From the organization's point of view, the effect of a different kind of workforce on productivity, company loyalty and employee morale is also an issue. In the past, productivity has been associated with experience and commitment. Will this change in a workforce where greater flexibility is required on the part of the employer? If the company does not offer the same security and long term commitment to the employee, will the employee respond in kind? We found some evidence of such a reaction from employees in the focus groups. For example, one older male stated:

> Make sure you know where you're going and the company can keep up to you. But there's absolutely no loyalty and dedication other than [to] yourself. Because, the next round of re-engineering, doesn't matter whether you have good cross-functional experience, and you've been contributing up to now, they could just decide that's not a service that [they] need.

We found NOVA employees, both contingent and permanent, to be quite supportive of the company's general restructuring and reengineering direction, but much less supportive of its downsizing; and we noted that managers themselves think that older workers will be disadvantaged by corporate restructuring.

At a much broader level, it is important to ask how the changing conceptions of career and retirement or early exit from the workforce will affect labour force participation rates and the ability of private pension and public social programs to support the older generation in retirement? The aging baby boomers may become a double burden because there will be more of them in the retirement years and more of them will be retiring early if current trends continue. Social policy may require that older workers stay in the workforce so that they can continue to contribute to the economy, even if this does not fit with the business needs of industry. The

balanced scorecard being adopted by NOVA and other corporations offers some hope of balancing social needs with employee, shareholder and business needs. Creative approaches that take into account the big picture and not simply a narrowly based profit-making orientation are needed if the maximum benefit is to accrue to all the players. In his times of economic trouble in his company, Henry Ford increased the salaries of his workers so that they could all afford to purchase a Ford motor car. Ford viewed his workers as customers and his prosperity increased as a result. Ultimately our economy is dependent on producers and consumers and achieving a balance between them.

From a sociological point of view, work is one of the central organizing institutions of society (Kohli, 1986). Work gives a rhythm to everyday life but also a stability and predictability to the entire life course. Work is central for identity, the sense of placement and social recognition that is important for well-being. We have seen, in NOVA, a demonstration of increasingly prevalent changes in the social organization of work and the life course. The result is to reduce the strength of the tie that links the individual to the employing company, and to promote a new sense of individualism. We cited NOVA management views promoting this new individualism, but the general corporate strategy if carried to extremes is well captured by James Meadows, a Vice-President for Human Resources at AT&T in the United States. According to the New York Times (February 13, 1996), he said:

> People need to look at themselves as self-employed, as vendors who come to this company to sell their skills.... IN AT&T, we have to promote the whole concept of the work force being contingent, though most of our contingent workers are inside our walls, Mr. Meadows said. "Jobs" are being replaced by "projects" and "fields of work," he said, giving rise to a society that is increasingly "jobless but not workless."

NOVA has not gone this far: while increasing the use of contingent employees it is committed to retaining a vital core of permanent employees. Yet both forms of employees voice reservations about downsizing, as we have seen.

Perhaps ironic is the fact that permanent full-time workers are working harder than ever at a time when there are increasing numbers of unemployed. However, our data suggest that contingent employees are also working extremely hard, often for more than one employer, and no doubt, without the same degree of benefits that NOVA offers to its permanent employees.

Our firm-based study of NOVA has shown that corporate strategies have a major impact on two aspects of working time: the ways in which the employer organizes work time on a daily, weekly, or short-term basis; and the ways in which work is organized over the entire life course. In the latter instance, NOVA is but one player among a growing number of corporations which are adopting work-time strategies that have profound social consequences. We believe that older workers are somewhat more vulnerable to these changes than are younger workers. Their skills set might not be as adaptive to rapid changes in the work situation; and they have spent large parts of their lives in a very different, much more stable work context. But the corporate changes that impact on them have not been explicitly targeted at older workers in the sense of age discrimination. Rather, corporate policies are adopted for other reasons (perhaps global economic, ideological theory or management theory) and have largely unintended consequences. Corporations have not sought to change the way people organize their life plans, but corporate restructuring is in fact restructuring the life course.

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SESSION 3B (i)

PATTERNS OF EMPLOYMENT AND WORKING TIME AMONG EARLY RETIREES OF A TELECOMMUNICATIONS FIRM

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PATTERNS OF EMPLOYMENT AND WORKING TIME AMONG EARLY RETIREES OF A TELECOMMUNICATIONS FIRM

INTRODUCTION

The North American (Canada and the United States) labour market, in contrast to that of Japan or Europe, is known for its flexible allocation of labour because the majority of employment relationships are governed either by individual contracts or by collective agreements within which there are virtually no restrictions on either the employer or the employee to continue the relationship. Two features of this system of employment lead to flexibility: the individual enters into an agreement to work for the employer for a fixed or indefinite period of time and the employer is free to end the agreement for many reasons including a reduction of demand for the product or service and an introduction of technology. In contrast, the majority of Japanese workers are protected from such uncertainty in the employment relationship because of an informal system of life-long employment, while European workers (e.g., Sweden) are cushioned from unemployment because of active labour market policies to ensure low levels of unemployment.[1]

Despite its reputation for the flexible allocation of labour, participants in the North American workforce enjoyed relatively stable employment (Ruhm, 1990). Hendricks (1992) attributed such stability to the economic boom between 1950 and 1970 when North American corporations assumed dominance in the world economy. The period was marked by long-term employment, fairer workplace, and the spread of other social welfare. Workers became accustomed to a pattern of labour market exposure which followed an orderly sequence from school to work to retirement. There were even those individuals who accumulated enough financial resources to afford early retirement. The economic conditions which allowed such a pattern of employment to evolve have changed, and it is expected that different patterns of employment would result from a new set of economic realities. On the demand side, globalization and other competitive forces have led to downsizing, and growth in nonstandard employment. On the supply side, the North American labour

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[1]For a detailed discussion of these systems and how they developed, see Adams (1995) and Harcourt (1996).

force is aging, a trend that has been accompanied by declining labour force participation rates, especially for men, and by a tendency towards early retirement, at least from career jobs. These demand and supply side trends have led to increasing use by firms of early retirement incentives to entice older workers to leave the workforce. This premature departure from work potentially has the impact of creating both a financial and a psychological need for early retirees to return to work.

There is some evidence in the United States of work in retirement, but there are few Canadian studies which systematically investigated work in retirement. In the United States, Herz (1995:13) showed that: "[b]etween 1984 and 1993, the proportion of pensioners who were working increased among all groups younger than 65 [....]" Ruhm and Sum (1988:25) provided additional argument for the trend that older workers are rejoining the workforce after retirement.

> Early departures from career jobs are associated with relatively lengthy post-career labor force participation. Even so, the rarity with which younger career job-leavers quickly retire is striking. Over 90 percent of respondents exiting career positions prior to age 50 remain in the labor force for at least a decade and fewer than one in 60 promptly retires [....]

In Canada, we know that the labour force participation of men over 55 years old has been declining over the last four decades (McDonald, 1994). This long term trend combined with the assumption that retirement is the end of the work cycle may have resulted in the dearth of information on work in retirement.

We have a unique data set which will allow us to investigate patterns of employment and working time among early retirees of Bell Canada, Canada is Canada's largest telecommunications firm. Distinguishing characteristics of this data set are that all of the respondents voluntarily retired from a long term career job and the majority of them left with a financial settlement. The data also allow us to show patterns of employment and working time across different occupational groups such as managerial, clerical and blue-collar jobs in Bell employment, men and women, union and nonunion workers, and older and relatively younger respondents (below 50 years old). While there are many unique advantages to using this dataset, there are also several limitations: the respondents are not representative of the general Canadian population; the dataset does not contain important information on race and pensions; and, it is not explicitly known whether the respondents prefer their chosen work

patterns. Nevertheless, the data provide a good window on patterns of employment and working time among a selected set of early retirees.

In assessing how well early retirees fare in the post-Bell employment experience, we are guided by two commonly held extreme scenarios. First, there is the "doom and gloom" scenario in which it is alleged that early retirees embark upon a postretirement work experience of nonstandard jobs and unemployment. Second, there is the "everything is rosy" scenario characterized by the notion that early retirees leave their career job and retire in luxury. We are specifically interested in examining the patterns of employment and working time among early retirees who returned to work after leaving their career employer, in an environment of change and job insecurity. We will endeavour to answer the following questions:

(a) What is the incidence of postretirement employment among early retirees?

(b) Are early retirees reentering into full-time full-year jobs with an employer (standard jobs)?

  (i) What proportion of early retirees reenters into standard employment?

  (ii) What proportion of early retirees reenters into paid vis-a-vis self-employment?

  (iii) What proportion of early retirees claims to be unemployed?

(c) What factors are associated with standard employment, paid employment, and unemployment?

To simplify the presentation of the results, and address a significant research gap, we have focused our analysis on the relationship between work experience and work in retirement[2].

This paper is divided into six sections to achieve its objectives. The next section reviews the literature on the labour force participation of older workers, the simultaneous receipt of pension and working, bridge employment, and nonstandard employment. Section three presents general theoretical perspectives on employment, and develops a theoretical framework of the relationship between work

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[2]We refer to the phenomenon whereby retirees reenter paid employment as work in retirement. However, in our case study, we were able to make the distinction between work in retirement with an employer other than the career employer. This is important because the "old" employment relationship was discontinued and the "new" one emerged with a different employer. It is not a continuation of employment, but a return to work issue. Work in retirement, postretirement employment, and postcareer employment are used interchangeably.

experience, standard employment, paid employment, and unemployment. Section four discusses the data used to show the relationship between work experience, standard employment, paid employment, and unemployment. The next two sections explain the empirical procedures used to identify the relationship between work experience, standard employment, paid employment, and unemployment, and present and discuss the empirical results as they relate to past research on work in retirement. The final section summarizes the main findings, discusses the implications of these findings for public policy, employers, unions, and employees, and identifies further research needs.

PAST RESEARCH

Issues of work in retirement and nonstandard employment remain distinct streams of study. The investigation of work in retirement (in the United States) has reported the level and explanations of the phenomenon without emphasizing the nonstandard nature of work in retirement. The investigation of nonstandard employment is usually done for the general population, with a concentration on the definition of nonstandard employment and the extent, causes, and impacts of part-time employment. Part-time employment has received much attention because it usually represents the largest nonstandard employment category. A relevant but underemphasized issue is the examination of the incidence of nonstandard employment among early retirees. We bridged these two research streams by partially focusing on nonstandard employment among early retirees.

Labour Force Participation of Older Workers

The study of postretirement employment emerged from conventional research on the labour force participation of older workers. The literature on the labour force participation of older workers has a long history, dating back to before 1977 when Quinn (1977) summarized the debate on the impact of health and wealth[3] on the labour force participation decision, and tested their impacts on the labour force participation of older workers. Quinn (1977) analyzed three sets of factors: personal and financial characteristics; local labour market conditions; and job characteristics. Quinn (1977) found

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[3]Throughout this paper, we refer to wealth as including personal and pension wealth, unless we make a distinction.

that both health and wealth were significant determinants of labour force participation, and that there was a substantial interaction between the two on labour force participation. Poor health and wealth negatively affect labour force participation.

A large part of the labour force participation of older workers research concentrated on the impacts of health and social security (Anderson and Burkhauser, 1985; Breslaw and Stelcner, 1987; Burtless and Moffitt, 1985). Anderson and Burkhauser (1985) explored the joint determination of health and work effort, and found that the probability of working and being in poor health is negatively correlated, and that the definition of health has empirical implications. When self-reported health was used, wage appears to influence retirement through the health variable, whereas when death was used, wage directly affects retirement. Breslaw and Stelcner (1987) used Canadian data to investigate the effect of health on the labour force participation, unemployment, part-time employment, and full-time employment. Breslaw and Stelcner (1987) reported that poor health is a deterrent to full-time employment. Concerning the impact of the receipt of Social Security on labour force participation, Burtless and Moffitt (1985) found that retirement propensities rise with age and adjusting the Social Security system by eliminating the Retirement Test would have very little effect on hours of work and virtually none on the average retirement age.

A small number of studies focused on the effect of economic status (Beck, 1985) and occupational content (Hayward and Grady, 1986; Hayward and Hardy, 1985) on the labour force participation decision of older workers. Beck (1985) analyzed the ways in which certain indicators of position in the economic structure affect the chance of experiencing unexpected retirement, and indicated that workers in higher-status occupations and those in core industries are more likely to retire at or near their expected age. Hayward and Grady (1986) and Hayward and Hardy (1985) were interested in occupational content (measured by growth rate, complexity, and physical demand of the occupation) and labour force participation of older workers. These studies reported that incumbents of occupations which are characterized by high growth rates, substantatively complex work, and require low physical demands were more likely to participate in the labour force.

The different work patterns of women have encouraged research on family obligations (Pienta, Burr, and Matchler, 1994) and post-school-age training (Hill, 1995). Pienta, Burr, and Matchler (1994) explored older women's participation in the labour force by examining their early experiences with family and work, and found that those who were more "family-oriented" (took time off to raise a family) were less likely to participate in the labour force in their later life. A conclusion was that those who did not experience interruptions in employment for family reasons were more "attached" to the labour force, and consequently were more likely to participate in their later life. Hill (1995) reported that post-school-age training resulted in higher productivity (and wages) which encouraged labour force participation.

The impact of structural factors on the labour force participation of older workers is also represented in the literature. Peracchi and Welch (1994) found time trends, and concluded that the probability of leaving the labour force was highest during a recession. McDonald and Wanner (1984) and McDonald (1994) argued that both individual and structural factors matter in the labour force participation decision of older workers. McDonald and Wanner (1984) showed that age, periods of high unemployment, farm occupation, and base income were negatively associated with the number of weeks worked, while marital status, years of schooling, and self employment were positively related to the number of weeks worked. These results were only true for men. McDonald (1994) revisited the retirement decision, and reported that the economically and socially advantaged retire early, while the converse is true for late retirement.

Studies on the labour force participation decision of older workers addressed the continuation of employment passed an arbitrary retirement age. Less emphases were on whether the participants were simultaneously receiving a pension and working, claimed to be retired, or departed from a career job and entered a new job (bridge job) before permanently leaving paid employment. Further, very little is known of the effect of work experience on labour force participation.

Simultaneous Receipt of Pension and Working, Postretirement Employment, and Bridge Employment

Available evidence, in the United States, confirms that a substantial minority of individuals worked after retirement. Ruhm (1991) presented evidence to show that many individuals continue to participate in paid employment for a number of years after they leave there career jobs or the jobs which they held for most of their working lives. Ruhm (1990) used the Retirement History Survey to show that almost two-thirds of the respondents were engaged in long-term employment (more than 15 years). However, about 60% of the respondents ended such career jobs before the age of 60 years, but less than 20% were retired before the age of 60 years. Herz (1995) used three waves of the Current Population Survey to demonstrate the increasing participation of retirees in paid employment. The largest increase of working in retirement was among the younger cohort (50-54 years old). Retirees went to both part-time and full-time employment, although a larger proportion of the 50-61 age group went to part-time work. Herz (1995) suggested five reasons for this increase of working during retirement: changes in the value of pension; early retirement pension incentives; the movement away from defined-benefit to defined-contribution (lump sum) pension systems; decline in health coverage; and trends in the local labour market. Herz (1995:20) concluded that: "[f]urther research into this new trend is necessary to fully understand the new patterns of work and retirement among early pensioners".

A number of explanations have been advanced for this postretirement employment trend. Health and wealth continue to be of central importance (Ruhm, 1990; Boaz, 1987; Parnes and Sommers, 1984; Myers, 1991). Ruhm (1990) showed that women, those with higher earnings, and pension coverage were less likely to participate in postretirement work. Boaz (1987) argued that working during retirement by both men and women is a response to low and moderate levels of nonwage income at the beginning of retirement; for men, work is a response to a decrease in the real value of nonwage income during retirement. Parnes and Sommers (1994) reported that good health and a distaste for retirement are positively associated with labour force participation. However, these and other factors which were previously found to affect retirement do indeed tend to explain the likelihood but not the extent of postretirement employment. Myers (1991) reported that training and job opportunities

available to workers, as indicated by career job occupation and education, are important determinants of postretirement labour force behaviour. Managers and those with higher education were more likely to participate in postretirement employment. In addition, wealth was found to reduce the probability of full-time employment. Morrow-Howell and Leon (1988) showed that those who did not participate in postretirement employment were more likely to be nonwhite, urban dwellers, and in poor health, whereas the group that continued to work had stronger work histories (e.g., higher incomes, more employment, and self-employment).

Work Experience and Labour Force Participation

Both preretirement and postretirement occupational characteristics[4] were hypothesized to affect postretirement employment. Along with the impact of health, Holden (1988) examined the predictors of work after retirement by focusing on the physical demands of the preretirement job. Holden (1988) found that: men in physically demanding jobs were associated with lower probabilities of working in retirement; the presence of a health limitation also lowers the probability of working in retirement; and the results were different for women, reflecting their different work histories. Beck (1985) focused on occupational and industrial differences in work activity of retirees, and reported that professionals, managers, proprietors, and farmers were more likely to reject retirement. In addition, Beck (1985: 275-276) suggested that:

> [t]he impact of institutional and structural constraints on employment opportunities is evidenced to some extent by the significant positive effect of periphery industrial sector and significant negative effect of unemployment rate [....]

Both Holden (1988) and Beck (1985) concluded that occupational characteristics affect work in retirement.

Although the main focus of Hayward, Hardy, and Liu (1994) was to investigated the effect of preretirement work characteristics, they found that the longer one stayed in the retirement status -- not working at all after leaving employment -- the less likely him or her would move back into

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[4] Note that the preretirement and postretirement jobs in these studies could be the same because no effort was taken to identify whether the preretirement and postretirement jobs were different. The focus was on working in retirement.

postretirement employment. Other findings included: full-time reentry was the most frequent destination; the majority of reentry occurred within one year of retirement; older men were less likely to return to work; and partial retirement is a distinct state. Among the work characteristics variables were: class-of-worker; number of hours worked per week; hourly wage rate; job tenure; and occupation. Relative to those who were previously self employed, those from the private and public sectors were less likely to be in postretirement employment. Those who enjoyed a longer job tenure were less likely to be in postretirement employment. In addition, those in professional, sales, and farm occupations were more likely to participate in postretirement employment.

A limitation of national surveys is that they contain a small number of, if any, factors about preretirement and postretirement jobs. Hardy (1991) overcame this barrier by using a unique data set to examine the determinants of reentry into postretirement employment for both men and women. Hardy (1991) reported that those men who retired at an earlier age were more likely to be in postretirement employment. However, age was not the only concern in the postretirement employment decision. Skills and more general characteristics that defined the particulars of the demand for an individual's service are important considerations. In addition to these general findings, Hardy (1991: 268) noted that:

> [t]he contrast between labour force reentrants and workers who remain out of the labour force is therefore a contrast between those who were successful in finding post retirement employment and those who were either unsuccessful or uninterested. By treating both the unsuccessful and the uninterested as a single group the research literature has not addressed the question motivating the present analysis: who are the older workers who want to reenter the labour force but remain unemployed?

Hardy (1991) handled this methodological concern by contrasting three groups: successful reentrants; those who desired reentry; and those who were uninterested in reentry. Concerning the work experience variable, Hardy (1991) used a socioeconomic status index, and found that those with a higher socioeconomic status were more likely to both reenter and retire from postretirement employment, relative to those who were interested but could not find employment.

In summary, the labour force participation research on older workers can be divided into three section to shed light on the on the research questions for this study: general labour force participation;

postretirement employment; and the effect of work experience on postretirement employment. The general labour force participation decision is affected by health, wealth, economic status, occupational content, family responsibility, post-school-age training, and structural factors such as unemployment. The determinants of postretirement employment generally mirror those of the general labour force participation decision. Such factors as health, wealth, distaste for retirement, available job opportunities, race, urban dwelling, and strong work histories are associated with postretirement employment. Few studies have concentrated on the effect of work experience on postretirement employment. Physical demands of the job, occupation, duration of the retirement spell, class-of-worker, number of hours worked, hourly wage rate, job tenure, and socioeconomic status are some work experience factors which are found to affect postretirement employment.

Nonstandard Employment

There is no consensus on the meaning of nonstandard employment (Polivka and Nardone, 1989), and many terms have emerged to represent that group of workers who do not find employment or work in a full-time full-year job with an employer; two such terms are atypical employment (Cordova, 1986) and contingent work (Polivka and Nardone, 1989). Cordova (1986:643-644) pointed out three types of atypical employment: self employment; atypical employment contracts (more than one employer); and clandestine work (undeclared work, family work, etc.). Polivka and Nardone (1989:9) commented on contingent work.

> A perception exists that firms are relying more heavily on part-time and temporary workers and contracting out for services previously performed in-house. These flexible arrangements, along with other arrangements that do not involve full-time wage and salary workers, have come to be referred to by labor market analysts as "contingent work."

Bronstein (1991:291) used the term standard employment, provided a broader view of it, and suggested the genesis of the movement away from standard to nonstandard employment.

> The "standard" employment relationship is characterized by an open-ended (or "without-limit-of-time") contract of employment for full-time work, performed for a single employer, and protection against unfair dismissal. In recent years, however, it has been blamed for rigidities that make it more difficult for enterprises to adapt to a changing and competitive economic environment, and an alternative model has emerged which is based on so-called "flexible" forms of employment; depending on one's bias, these are referred to as "new forms of

employment", "special forms of employment" or "precarious, casual or marginal employment".

A common theme among these views is that any form of employment other than full-time with an employer may be considered as nonstandard employment.

Part-time employment is usually the most frequent form of nonstandard employment, and overwhelmingly occupied by women. For example, the Canadian labour force is made up of around 30% nonstandard employment (Betcherman, McMullen, Leckie, Caron, 1994:77) of which 17% is part-time employment and 70% of these part-time workers are women (Survey of Work Arrangements, 1994).[5] The over representation of women in part-time employment occurs for a number of reasons ranging from preferences to outright discrimination, and has developed a research interest around the world. Williams (1995) showed that, in the United States, women's participation in part-time employment is on the decline, and Rosenfeld and Birkelund (1995) reported that there are national variations in women's participation in part-time employment. For example, one-fifth of employed women in the United States participate in part-time employment, while over 50% of employed women in Norway engage in part-time employment.

The literature on nonstandard employment has effectively described incidence of various forms of nonstandard employment, but insufficiently explained nonstandard employment. However, it is conceivable that both individual and structural (e.g., macroeconomic conditions) factors affect nonstandard employment. A gap in the literature is the description and explanation of nonstandard employment among retirees. It is important to fill this gap for two reasons: retirees are reentering

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[5] According to the Survey of Work Arrangements, in November 1991, the majority (77%) of the Canadian labour force were paid workers. Among paid workers, 83% worked full time and 17% worked part time. Of those who worked full time, 96% worked for 7 or more hours per day. Full-time workers were predominantly men (56%). Considering part-time work, 41% worked below 7 hours per day, and a large majority (70%) of part-time workers were women. A significant minority (30%) of paid workers worked either less or more than 5 days per week. To summarize, 15% of the labour force were self employed, and 77% were paid workers - of which 17% worked part time, and 30% worked either less or more than 5 days per week. For a more dynamic view of nonstandard employment, Betcherman et al. (1994:77) reported that in 1975 nonstandard employment accounted for 24% of total employment; this amount had risen to almost 30% by 1993. For a distribution of part-time employment in the United States, see Nardone (1995). These statistics suggest that there is a substantial number of individuals who are engaged in nonstandard employment. Moreover, the argument has been advanced that nonstandard employment is likely to become the norm (Lerner, 1994; Rifkin, 1996). In addition, Smith (1994) argued that the institutionalization of "flexibility" in organizations has contributed to the rise of nonstandard employment.

paid employment in significant numbers and it is recommended that older workers fill contingent employment positions (Brown and Gray, 1991).

ANALYTICAL FRAMEWORK

Once an individual leaves his of her career job, he or she essentially has to make one of two choices: exit from paid employment or aspire to rejoin paid employment. For those who want to work, some would find work while others would remain unemployed. Thus, we have three categories of employment to which early retirees may belong: not interested in paid employment, working, or unemployed. For those who reenter the labour market, they can either work for themselves or work for someone else, on a full-time or part-time basis for part or the whole year. At a most disaggregate level, those who rejoin paid employment fall into five categories: full-time full-year; full-time part-year; part-time full-year; part-time part-year; and self-employment (a distinction is not made between full-time and full-year self-employment). These disaggregate categories of employment are referred to in this study as working time.[6]

Table 1 is a numeric presentation of the derivation of the categories for patterns of employment and working time. Although a majority (58%) of the respondents considered themselves to be out of the workforce, a substantial minority (39%) were engaged in work after Bell, and only 3% claimed that they were unemployed. This level of work in retirement is very similar to the levels reported in the United States (around 32%). Among those who were interested in work after Bell, in their most recent job, 17% held a standard job, 65% were found in some form of paid employment, and 6% were unemployed. A noteworthy point is the uncertainty of the permanency of the exit from paid employment. In addition, a considerable number of individuals differ in their intentions and actions on the permanency of the departure. For example, 22% of those who considered the departure from Bell to be a permanent one reported that they had worked for pay since leaving Bell and did not

[6]From a rational perspective, one could assume that the preferred destination would be full-time full-year with an employer. However, we must be cognisant of the fact that the sample contains early retirees who may prefer other alternatives such as part-time full-year employment.

experience any period of unemployment.

Theories of Employment: A number of theoretical frameworks have contributed to the explanation of employment in general. The human capital approach is based on the notion that investments in education and work experience play a major role in employment. Life course theorists have argued that a more holistic approach is appropriate for the study of postretirement employment, which encompasses school, work, retirement, and family responsibilities such as child care and elder care. From a labour economics perspective (using the income-leisure framework), an individual's decision to reenter paid employment would be affected by his or her reservation wage which is influenced by a number of factors including those put forth by human capital and life course theorists. A common element among these frameworks is the focus on the supply of labour, and the importance of individual characteristics in the supply decision. Political economists have claimed that structural factors such as the level of unemployment also affect the supply decision. Periods of high unemployment may motivate an individual to withdraw himself or herself from paid employment, providing that other conditions (financial and psychological) permit him or her to do so. Finally, from a career development or noneconomic perspective, those who leave a job on a negative note tend to carry a "bitter taste" for work, and may not seek further employment. This is known as the "poisoning effect" (Braginsky and Braginsky, 1975; Fineman, 1983).

Our task in this section is to build a model to explain standard employment, paid employment, and unemployment as variations of working time. Informed by the literature review and theoretical perspectives, we have arranged the explanatory variables into four categories: preretirement work characteristics, the centrality of work, and the decision to leave; postretirement work characteristics; individual and family characteristics; and structural characteristics.

Standard Employment, Paid Employment, and Unemployment

We define standard employment as full-time full-year employment with an employer, and nonstandard

employment as full-time part-year, part-time full-year, and part-time part-year employment with an employer. We exclude those who were either unemployed or self employed from the analysis of standard employment. Paid employment includes: full-time full-year; full-time part-year; part-time full-year; and part-time part-year employment with an employer. Self-employment is self explanatory. Those who indicated that they were ever out of work and looking for a job in the paid labour force, and have never worked for pay since leaving Bell were classified as being unemployed. In summary, we are interested in estimating the probability of attaining standard relative to nonstandard employment, paid relative to self-employment, and unemployment relative to employment considering preretirement work characteristics, the centrality of work, the decision to leave, postretirement work characteristics, individual and family characteristics, and structural characteristics.[7]

Preretirement Work Characteristics, the Centrality of Work, and the Decision to Leave

Preretirement work experience cultivates a relationship between an individual and work in general. Those who experienced a positive work experience would likely remain attached to work, and be more likely to work in retirement. We examined three preretirement work characteristics: tenure, union membership, and job mobility (promotions). Longer tenure (Morrow-Howell and Leon, 1988), management status (Beck, 1983; Myers, 1991; Morrow-Howell and Leon; Beck, 1985; Hayward, Hardy, and Liu, 1994), and upward job mobility are generally considered as desirable work experience which may encourage postretirement work activity. Conversely, an individual who enjoyed such desirable work experience may be content to leave on a "high note" to pursue life-long wishes such as self employment (for example, Hayward, Hardy, and Liu [1994] found that longer tenure lowers the probability of participation). Therefore, we are unsure of the direction of the relationship between preretirement work characteristics and work in retirement.

A more predictable relationship is the one between the centrality of work to the individual and labour

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[7]Throughout this section we refer to work in retirement as standard and paid employment, unless we say otherwise. The data used in this study are made up of respondents who left the organization between 1985 and 1995. As such, some of the respondents have worked in more than one jobs. We selected the most recent job to disaggregate working time. This should not be a problem because most (74%) of those who experienced standard employment have done so in their most recent jobs.

force participation. An individual who experienced job satisfaction and views work as a central psychological state is more likely to participate in post-Bell work (analogous to what Parnes and Sommers [1994] referred to as a distaste for retirement). As shown in the Appendix, we used ten questions to distinguish three factors which capture job satisfaction (extrinsic and intrinsic) and the importance of work to the individual. Individuals who were previously driven by extrinsic satisfaction would more likely work in retirement for the money (in a standard job), while those who were motivated by intrinsic satisfaction would more likely not be able to cultivate such a relationship with a post-Bell job and consequently would not be found in standard employment. In addition, those individuals who reported work to be of central importance in their lives would likely work in retirement.

Another important consideration in the post-Bell employment decision relates to characteristics of the departure. Some individuals left with an exit incentive while others did not, and receiving such an incentive could have the effect of encouraging permanent withdrawal from the labour force. Others who received an incentive may choose to pursue private business activities. We also anticipate that those who claimed a negative reason for leaving would generally be more hostile to employment, and would not work in retirement (the poisoning effect). Finally, those who justified their departure by anticipating a new career would likely be in standard employment.[8]

Postretirement Work Characteristics

As the economic environment undergoes restructuring, certain high-status occupations and core industries will emerge. Occupations that require routine skills would be automated, and those who are less skilful would be relegated to nonstandard employment. Similarly, industries which engaged in high-technology such as communications would be the host of standard employment. We expect

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[8]Respondents were asked to indicate reasons for the departure from Bell. A maximum of three responses were coded into sixteen categories which were subsequently collapsed into positive (incentive package financially attractive, financially able, and ready to go), negative (involuntary separation, not happy at Bell, job insecurity, job dissatisfaction, stress at work, plateauing, and age discrimination), anticipated new career, and other reasons (poor health, good health, family/personal, work related, and others).

that those in professional and managerial occupations would be found in standard employment because of their ability to transfer their inventory of skills (Beck, 1983; Hayward and Grady, 1986; Hayward and Hardy, 1985; Myers, 1991; Beck, 1985, Hayward, Hardy, and Liu, 1994). This argument also holds for those in the communications industry who are found in the "core" sector, and are more likely to have standard employment (Beck, 1983).

Individual and Family Characteristics

The individual and family characteristics are grouped into five categories: age; health; wealth; other individual characteristics; and family characteristics.

Age: A predisposition is that older individuals are more inclined to leave permanent employment. We investigate two age related variables: age at leaving and whether the individual left after his or her preferred age.[9] Those who left the career employer at an earlier age would more likely be engaged in standard and paid employment (Hardy, 1991). The traditional argument is that younger individuals have both a financial and a psychological need to work. Age as a predictor of standard employment is less effective when the departure from permanent employment is motivated by an exit incentive. We include another age related variables to capture this "premature" exit, and expect that those who left after their preferred age would not return to standard and paid employment.

Health: Health affects labour force participation either by limiting an individual's ability or conjuring thoughts of higher health care costs among employers. An individual who is physically limited form working would not participate. In addition, and more so in the United States, employers would prefer to retain or recruit healthier individuals because of anticipated less health care cost. Health care cost is not an issue for employers in Canada because health care is a national responsibility (McDonald, 1994). Respondents were asked to report whether they had visited a doctor and they

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[9]We do not feel that using an individual's current age would further the explanation of work in retirement because the individual may not currently be in the labour market. The more important age variable is the age at which the individual left Bell. Further, there is a positive correlation of 80% between current age and age at leaving Bell.

had a health condition which would limit their labour market activity. We expect that those in better health (not visit doctor and no health limitation) would participate more in postretirement employment (Quinn, 1977; Anderson and Burkhauser, 1985; Breslaw and Stelcner, 1987; Parnes and Sommers, 1994; Morrow-Howell and Leon, 1988; Holden, 1988).[10]

Wealth: Wealth allows an individual to buy more of everything, including leisure. Wealth is divided into individual and pension wealth.[11] To represent individual wealth, we used home ownership, debt over $5,000, investment income, and whether the individual's current and future financial situations are adequate to satisfy their needs. Those who own a home and are receiving an income from investments are designated to be more wealthy, while those who owe a debt are considered to be less wealthy. Receipt of Old Age Security and Canada Pension Plan/Quebec Pension Plan (CPP/QPP) were used to include pension wealth. Further, those who reported that their current and future financial situations were adequate to satisfy their needs would not be interested post-Bell employment. As such, all variations of wealth are expected to deter postretirement work (Burtless and Moffitt, 1985; McDonald, 1994; Ruhm, 1990).

Other Individual Characteristics: Gender (Ruhm, 1990), education (Hill, 1995; Myers, 1991), size of community (Morrow-Howell and Leon, 1988), and volunteer activity are hypothesized to affect postretirement work. Women are disadvantaged in the general labour market (for reasons discussed elsewhere); therefore, we expect that women would be found disproportionately in nonstandard and paid employment. Education is a valued characteristic which we expect to encourage standard and paid employment. The size of the community is an important variable for two reasons: the location of an individual's home reflect preferences and the community is subjected to local labour market realities. Unfortunately, we are unable to disentangle preferences from labour market conditions. Nevertheless, we expect that larger communities would have more opportunities for standard and self

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[10]Visiting a doctor is not necessarily an indication of poor health. However, it was one of the few health related variables with sufficient variation. Having a health limitation is a more accurate measurement of health.

[11]The criterion to be included in the population for this study was the receipt of a pension from Bell. Unfortunately, we do not have the actual amount of the pension, and resolved to other measures of pension wealth.

employment, and those who live in such communities would be disproportionately found in standard and self employment. Those who elect to volunteer in unpaid activities have less time to participate in paid employment. Incidence of volunteer activity is expected to negatively affect postretirement work.

Family Characteristics: Family characteristics include two categories: marital status and the work situation of an individual's spouse are included in one group and family care (child and others) in the other group.[12] Married individuals have more financial responsibility and would aspire for standard employment (more income than nonstandard employment and less risky than self employment). Someone with a working spouse may look to postretirement work for psychological reasons. Concerning family care, a casual interpretation of the effect of family care on postretirement work would lead to the conclusion that someone who has to provide such care would be less inclined to participate in postretirement employment. However, the condition may be such that family care motivates postretirement work.

Structural Characteristics: The level of unemployment and cost of living at the moment of departure from the career job would contribute to the decision on whether to engage in postretirement work. High levels of unemployment may motivate complete or partial withdrawal because of the unavailability of standard or paid employment (Peracchi and Welch, 1994; McDonald and Wanner, 1994). High cost of living may encourage reentry (Boaz, 1987). In addition, the longer an individual had been out of his or her career job the more time he or she has had to make a readjustment to postretirement employment. An individual who left his or her career job in 1985, relative to someone who left in 1995, has had more time (and more opportunities) to make the decision on whether standard or some other form of postretirement employment would satisfy his or her financial and psychological needs to work.

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[12]Child care is for grandchildren and family care is for a family member or close friend who has a disability.

DATA AND ANALYTIC TECHNIQUES

The data for this study are taken from the Survey of Work and Lifestyle Activities (SWLA). The SWLA was conducted by the Centre for Studies of Aging, University of Toronto, with cooperation from Bell Canada, and funded by Human Resources Development Canada. The population for this study are 6,846 former Bell Canada employees who left between 1985 and 1995. Ouestionnaires were sent to a sample of 3,614 individuals in July, 1995. This sample was arrived at by enumerating the 45-50 age group, and randomly selecting 50% of the remaining group (above 50 years old). Enumerating the 45-50 age group was done to ensure enough respondents from the "early retirees" group. From the 3,614 sample, 38 could not reply due to poor health, death, or relocation. Two thousand one hundred and forty seven (2,147) individuals returned completed or partially completed questionnaires, resulting in a 60% response rate. The results presented in this study are based on weighted data which corrected for the initial stratification by age. Although there were statistically significant differences between the population and sample on such key variables as age, tenure at Bell, age at departure, marital status, occupation, and gender, most of the differences were substantatively small.[13] More managers (40.2% in sample and 33.1% in population) and more men (63.2% in sample and 57.3% in population) responded to the questionnaire. We did not correct for this response bias. To describe patterns of employment, we used 1,944 cases which contained information on all the relevant variables. Seven hundred and fifty eight (758) cases were used to describe working time of which 463 were used in the standard employment equation, 672 in the paid employment equation, and 715 in the unemployment equation (Table 1).

We focused on standard employment, paid employment, and unemployment for a number of reasons. At the onset, we sought to investigate nonstandard employment among early retirees to bridge two disjointed research streams. The reason for choosing paid employment is the "special" nature of the sample. We have a group of individuals who experienced relatively stable career with an "affluent employer". Many of these early retirees acquired the necessary financial capital to pursue self

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[13]Those individuals in the sample relative to those in the population were younger, had longer tenure, were younger at departure, fewer were married, more were managers, and more were males.

employment. Unemployment is a central public policy concern, and that we focus on unemployment among retirees do not diminish the centrality of unemployment as a public policy concern. In order to conduct this analysis, we created three dichotomous variables: standard versus nonstandard employment; paid versus self employment; and unemployment versus employment. We used logistic regression[14] to determine which factors are associated with standard employment, paid employment, and unemployment.

RESULTS

In Table 1, we reported that 58% of the respondents considered themselves to be out of the workforce, 39% were engaged in post-Bell work, and only 3% claimed that they were unemployed. In Table 2, we showed preretirement and individual characteristics for the full sample of respondents (weighted n = 1,944). It appears that those with longer tenure, managers (relative to union members), and those who had experienced upward and lateral job mobility (relative to upward or lateral) were more likely to be in post-Bell employment. The distribution of post-Bell employment among selected individual characteristics also shows that those with characteristics which are favoured by the general labour market were more likely to find employment. Younger individuals were more likely to be in the workforce while older workers were more likely to be out of the workforce. An important observation is that those individuals who were below 50 years old when they left were more likely to be interested in employment. Similarly, the results show that women were less likely than men to be employed, and those with more education were more likely to be employed than those with less education. Overall, these unadjusted differences suggest that people who were relatively successful in their preretirement work environment and who were endowed with

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[14]One represents a positive response, and we are interested in the determinants of a positive response. We cannot use ordinary least square regression because the error terms are not normally distributed, and systematically vary with the explanatory variables (heteroscedascity). In addition, the predicted probabilities can fall outside the theoretical bounds of zero and one. Logit analysis utilizes a nonlinear function to relate the probability of predicting a positive response to various explanatory variables. As such, the predicted probabilities are restricted to fall between zero and one. However, the logit coefficients, by themselves, do not provide the effect of a unit change in the explanatory variable on a positive response. The following formula is used to translate the logit coefficients into changes in probabilities: $\Delta P_i = [\ 1+\exp\{-\ln(P/1-P) - b_i\}\ ]^{-1} - P$, where ΔP_i is the change in probability resulting from a unit change in the explanatory variable, P is the mean of the dependent variable, and b_i is the logit coefficient for the explanatory variable.

individual characteristics which the labour market rewards were likely to be more successful in post-Bell employment.

Among those who were able to find post-Bell work, 23% held a standard job at some point in their post-Bell work experience. However, as Tables 1 and 3 indicate, for the most recent post-Bell jobs, 17% were found in standard employment and 65% were in paid employment. Table 3 also shows that 6% of those who were interested in post-Bell employment reported being unemployed. The distribution of working time among a selected set of preretirement, postretirement, and individual and family characteristics for the most recent post-Bell job is presented in Table 3. Concerning preretirement work characteristics, those with longer tenure, managers, and those who had experienced upward and lateral job mobility were more likely to be in full-time full-year and self employment. If one considers these two employment outcomes to be desirable, then one may conclude that those who enjoyed desirable preretirement work characteristics were also more likely to enjoy desirable postretirement work.

A somewhat different pattern emerges from an investigation of postretirement work characteristics and working time. Incumbents of high-status occupations such as professional and management were more likely to find standard and self employment. Unskilled workers found mostly part-time employment. The "core sector" argument is not true for those who were in the communications industry which we considered to be a "core" industry. Those who found jobs in the communications industry were more likely to be in part-time full-year employment. Standard employment was most prevalent in "other services" -- where the majority of jobs are created in the restructured economy. In addition to postretirement occupation and industry, we investigate the associations among postretirement education, the number of post-Bell jobs, and working time. Those who have taken post-Bell training were more likely to be in part-time part-year, full-time full-year, or self employment. That those who embarked upon post-Bell training were found in part-time part-year employment is not surprising because post-Bell educational activities encompassed both labour market and leisure/pleasure activities. Finally, among the postretirement work characteristics, those who had experienced more post-Bell jobs eventually found themselves in full-time part-year or self

employment.

The associations among individual and family characteristics and working time pose some unexpected results. We expected younger workers and those who left at an earlier age to find standard employment. The results show that older workers were more likely to be in standard employment, and specifically those who left below 50 years old were more likely to be in self employment, full-time part-year employment, or unemployed. A tentative conclusion is that younger workers and those who left at a younger age are more likely to face "adverse" postretirement employment. The two variables used to measure health show different effects on working time. Those who visited a doctor were more likely to be in a part-time part-year job, and those who reported having a health limitation were either unemployed or found in full-time part-year, part-time part-year, or full-time full-year employment. A clearer pattern is seen among females who were less likely to be in standard and self employment. More education generally encouraged standard and self employment. Those who resided in large communities were more likely to be self employed or be in a full-time part-year job. Those who volunteered in unpaid activities were less likely to be in any form of full-time employment. In conclusion, for the individual and family characteristics, those who provided family care were more likely to be in part-time part-year or full-time full-year employment, and those who provided child care either found full-time part-year employment, were unemployed, or self employed. These results are very interesting because they clearly show that the factors which are associated with "employment" are not necessarily associated with "standard employment".

A fundamental research interest in this paper is an investigation of the factors which are associated with standard employment, paid employment, and unemployment, as variations of working time (Table 4). Significant predictors of standard employment are: job mobility; intrinsic job satisfaction; the importance of work; the reason for leaving; postretirement occupation and industry; the age at which the individual left his of her career job; receipt of CPP/QPP; education; size of the community; and participation in volunteer activity. Relative to those who had experienced upward job mobility, those who had experienced all other forms of job mobility (upward and lateral, lateral, and others) were more likely to be in standard employment. Those who had enjoyed intrinsic satisfaction were

less likely to be in standard employment, and those who reported work to be of central importance in their lives were also more likely to be in standard employment. Relative to those who gave a negative reason for their departure from Bell, those who reported the availability of a new career were more likely to be in standard employment. Being a manager (relative to an unskilled worker) and having a job in the communications industry (relative to other services) were positively related to standard employment. Concerning the age at which the individual left Bell, those who left at an older age were more likely to be in standard employment. Finally, those who were receiving CPP/QPP, residing in a large community, and participating in volunteer activities were less likely to be in standard employment, while those having a university education (relative to high school or less) were more likely to be in standard employment.

These results are not surprising, are mostly in the expected direction, and if not in the expected direction, then there is a reasonable explanation. We were unsure about the direction of job mobility; that those who experienced any other forms of mobility were more likely that those who experienced upward mobility to be in standard employment can be explained by the presumption that those who experienced upward mobility were more "selective" in their choice of post-Bell employment or preferences. Our expectation of the associations between intrinsic job satisfaction, the importance of work to the individual, new career opportunity as a reason for leaving Bell, postretirement occupation (being in management), being in the core communications industry, and standard employment are supported by the results. We found a negative relationship, contrary to our expectation, between the age of leaving Bell and standard employment. Our findings show that those who left at an older age were more likely to be in standard employment, may be reflecting the uniqueness of the sample in which respondents were generally more skilful than the general population. The impact of the receipt of CPP/QPP, eduction, and volunteer activity were all in their expected directions. Contrary to our expectation, it seems as though large communities (relative to small ones) presented more opportunities for nonstandard employment.

A smaller number of factors are associated with paid employment, and the relationships are in their expected directions. Paid employment is related to postretirement occupation and industry, gender,

education, volunteer activity, and child care. Relative to unskilled workers, those in any other occupation were less likely to be in paid employment. Relative to other services, those in communications were more likely to be in paid employment. As expected, women were disproportionately found in paid relative to self employment. Relative to those with a high school education or less, those with a university education were less likely to be in paid employment. Finally, those who reported to be participating in volunteer activities and providing child care were less likely to be in paid employment.

The factors which are associated with unemployment are very different from those which are associated with standard and paid employment. Being from the CTEA (a union representing clerical workers) relative to management, reporting other reasons for leaving Bell (relative to a positive reason), or being from a medium or large community (relative to a small one) were positively associated with unemployment. Those who left after their preferred age, reported that their future financial situation would adequately (relatively to inadequately) meet their needs, and were out of Bell for a longer period of time were less likely to be unemployed.

Standard employment, paid employment, and unemployment are associated with a different set of factors. Standard employment is associated with a wider range of factors including preretirement work characteristics, the centrality of work to the individual, the decision to leave, postretirement work characteristics, and individual characteristics, while paid employment is related to a smaller set of factors including postretirement and individual and family characteristics. Similar to standard employment, unemployment is associated with a wide range of characteristics. However, the factors which are associated with unemployment are very different from those which are associated with standard or paid employment. There is only one common factor which is related to standard employment, paid employment, and unemployment; those who were living in a large community (relative to a small one) were less likely to be in standard employment and more likely to be in paid employment and unemployment. The importance of describing these differences is to show that lumping employment into one homogenous category is not an acceptable proposition. It is important to investigate different types of employment outcomes to achieve a better understanding of

employment and working time among retirees.

Many of those who left Bell within the study period (1985 to 1995) were former managers. In fact, the early retirement incentive programs were designed to target middle management. In addition to investigating the factors which are associated with standard employment, paid employment, and unemployment for all those who were interested in post-Bell employment, we have also analyzed those factors which are associated with standard and paid employment among former Bell managers. We did not have enough cases to examine the unemployment outcome among managers. Our results in Table 5 show that the centrality of work, post-Bell occupation and industry, the receipt of CPP/QPP, university education, volunteer activity, child care, and unemployment rate are associated with standard employment among managers. The centrality of work, all other occupations (relative to unskilled workers), and child care were positively associated with standard employment, while those who were in other industries (relative to other services industries), receiving CPP/QPP, participating in volunteer activity, and unemployment rate are negatively associated with standard employment. Among former Bell managers, and relative to unskilled workers, owners, professionals, and those in management occupations were less likely to be in paid employment, while (relative to those in other services industries) those in the communications industry were more likely to be in paid employment. Female managers, managers with a university education, and managers who volunteered were less likely to be in paid employment.

Summary of the Results with Reference to Past Research

The most striking discrepancy between the findings of past research and those presented in this study is the effect of health on post-Bell employment. While others have overwhelmingly found a negative impact of poor health on labour force participation, we were unable to report such an effect. There are many possible reasons for our finding: health may affect the incidence of employment but not the extent (or what we referred to as working time) of employment or health may be less of an issue in Canada, although Breslaw and Stelcner (1987) found a health effect in Canada with a very complex measure of health. Generally, we found that wealth discourages post-Bell employment, which is

consistent with the literature. For example, the receipt of CPP/QPP is negatively related to standard employment, and those who reported that their future income would adequately satisfy their needs were less likely to be unemployed. However, we note that there were no overwhelmingly wealth effect on the labour force participation of early retirees. We could not detect an association between post-Bell training and post-Bell employment, and this may be because the training activities were not always directed at labour market success. Many of the respondents engaged in post-Bell training for leisure/pleasure.

Our results are consistent with those of past research in a number of areas. Concerning occupational status, we found that managers were more successful in their post-Bell employment experience (less likely to be unemployed), and managers in the post-Bell job were more likely to be in standard employment. Those in the communications industry (core) were more likely to be in standard and paid employment, indicating the transferability of their skills. Women were more likely to be in paid employment, and women managers were less likely to be in standard employment. Only among managers did we detect the negative effect of unemployment rate on standard employment; periods of high unemployment are negatively associated with standard employment.

We set out at the onset of this paper to bridge the two research streams of standard and postretirement employment by investigating nonstandard employment among early retirees. Nonstandard employment is a frequent reality among early retirees. In fact, the majority of post-Bell jobs were found in the nonstandard categories (all the working time categories except full-time full-year). An important consideration which we were unable to comment on was whether such jobs were preferred by the early retirees. However, we can speculate with reasonable confidence that standard and self employment were desirable employment outcomes because those with characteristics which the general labour market favours were more likely to be in standard and self employment. Manifest unemployment was not a real concern, albeit the level raised to 6% when only those who were interested in postretirement employment were considered in the analysis. This does not shed light on the level of unemployment hidden among those who selected out of the workforce because of foreseen hardship in finding acceptable employment.

CONCLUDING OBSERVATIONS

The purpose of this paper was to investigate the employment and working time of early retirees. Let us return to the specific research questions to show that they were answered to a satisfactory level. First, we found that 39% of early retirees were engaged in postretirement employment. Second, most of those who were interested in postretirement employment opt for self employment. Other popular destinations were part-time part-year, part-time full-year, and full-time full-year employment. We defined standard employment as full-time full-year employment, and reported that 23% found standard jobs, and 17% did so in their last postretirement job. Paid employment accounted for 65% of postretirement employment, 29% opted for self employment, and 6% reported being unemployed. Third, we found a positive relationship between all other forms of job mobility (relative to upward mobility), the importance of work to the individual, the availability of a new career (relative to a positive reason for leaving), management occupation (relative to unskilled workers), communications industry (relative to other services), age at leaving, university education (relative to high school and less), and standard employment. Experiencing intrinsic job satisfaction, receiving CPP/QPP, residing in a large community (relative to a small one), and participating in volunteer activity are negatively associated with standard employment. Paid employment is positively associated with the communications industry (relative to other services), and being female, while negatively associated with owner, professional, management, skilled occupations (relative to unskilled), university education (relative to high school or less), participation in volunteer activity, and providing child care. Unemployment is positively associated with being a member of the CTEA (relative to managers), other reasons for leaving (relative to positive), and being from a medium or large community (relative to a small one). There is a negative association between unemployment and those who left after their preferred age, those who claimed that their future financial situation would adequately satisfy their needs, and those who have been out of Bell for a longer period of time.

These findings have a number of implications for public policy, employers, unions, and employees. The incidence of postretirement employment brings into question those policies which are designed under the false assumption that retirement means not interested in labour market activity. To endorse

early retirement policy is unfounded, and there may be hidden unemployment among those who decided to withdraw from the workforce because they foresee a difficulty in finding standard employment. Unfortunately, we were unable to determine whether selection into the various categories of working time are desirable or forced upon those who must participate in postretirement employment. Nevertheless, postretirement employment and working time are especially important for public policy because employers have accepted early retirement as a legitimate mechanism to downsize their workforce. Even unions have ignored the postretirement consequences of older workers. Apart from negotiating the delay of early retirement, unions should ensure that such programs are implemented when the general labour market is experiencing low unemployment rates so that postretirement standard employment is a viable alternative for older workers. In conclusion, employees must incorporate postretirement employment conditions into the decision on whether to accept or not accept an early retirement incentive, if they have a choice.

Postretirement employment and working time are unexplored domains in Canada. However, the study of postretirement employment must be approached from an interdisciplinary perspective beginning with the decision to accept an early retirement incentive (or leaving a career job) and ending with the "final" withdrawal from employment. A research agenda on postretirement employment should include: an investigation of early retirement; incidence of postretirement employment; quantity and quality of postretirement employment; desirability of postretirement employment; satisfaction with postretirement employment; and alternatives to postretirement employment.

APPENDIX: CREATING THE PSYCHOLOGICAL MEASURES

Respondents were asked to respond to the following ten questions under a sub-heading of "Job Satisfaction with your last Job at Bell". The response format was a four point likert-type scale ranging from strongly disagree (1) to strongly agree (4).

A. There was a lot of freedom to decide how I do my work.
B. I did the same thing over and over.
C. The pay was good.
D. My chances for promotion or career development were good.
E. I liked my job.
F. I enjoyed the people I worked with.
G. The work I did was one of the most satisfying parts of my life.
H. Some of my main interests and pleasures in life were connected with my work.
I. To me, my work was just a way of making money.
J. The benefits were good.

A factor analysis (extraction = principal component; number of factors = 3; rotation = varimax) resulted in the following loadings:

	Factor 1	Factor 2	Factor 3
A	**.67**	.09	.05
B	**.33**	.34	-.28
C	.06	.19	**.78**
D	**.55**	-.08	.27
E	**.78**	.28	.07
F	**.65**	.18	-.01
G	**.72**	.41	.07
H	.27	**.71**	.14
I	.08	**.84**	.03
J	.15	-.04	**.79**

The above three factors provided an explanation for 56% of the variation. We interpreted Factor 1 as intrinsic satisfaction, Factor 2 as the centrality of work, and Factor 3 as extrinsic satisfaction. We subsequently formed scales using these factor loadings (and interpretation). The Cronbach Alphas for the three scales are: .73 for intrinsic satisfaction; .56 for the centrality of work; and .55 for intrinsic satisfaction.

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Table 1: The Classification of Patterns of Employment and Working Time (%), SWLA, 1995

Have you ever worked for pay since leaving Bell?	At any time since leaving Bell were you out of work and looking for a job in the paid labour force?	At the time you left Bell, did you consider this a permanent exit from paid employment?			Patterns of Employment and Working Time
		No	**Yes**	**Don't Know**	
No	**No**	18	77	57	Out of the Workforce (1,132)
	Yes	5	1	6	Unemployed (48)
Yes	**No**	58	21	28	Employed[a]
	Yes	19	2	10	Employed[a]
Number of Cases		**552**	**1,202**	**190**	**1,944**

[a] The employed category contains 764 cases, and are distributed among the following disaggregate groups: fulltime fullyear (128); fulltime partyear (46); parttime fullyear (150); parttime partyear; and self employed (216). This is the disaggregation for the most recent post-Bell job, and do not add up to 764 in the regression equations in Tables 4 and 5 because of missing cases.

Table 2: Employment by Selected Preretirement and Individual Characteristics Among Early Retirees, SWLA, 1995

	Out of the Workforce	Unemployed	Employed	All
Preretirement Work Characteristics				
Tenure (Years)	31.80	28.81	32.95	32.18
Union Status (%)				
Managers	32.77	43.33	63.98	45.30
CTEA	22.33	28.89	9.78	17.56
CEP	35.63	22.22	17.90	28.33
Others[a]	9.27	5.56	8.33	8.81
Job Mobility (%)				
Up	14.61	15.56	14.43	14.56
Up and Across	39.42	44.33	58.08	46.85
Across	21.35	27.78	19.29	20.70
D, F, and DK[b]	24.63	13.33	8.19	17.89
Individual Characteristics				
Age (Years)	61.03	58.73	59.79	60.49
Age at Leaving (%)				
Below 50	4.49	11.11	10.06	6.84
50-55	34.46	35.56	48.16	39.87
56-60	44.85	33.33	34.14	40.36
Above 60	16.20	20.00	7.63	12.93
Female (%)	44.66	34.44	22.83	35.83
Education (%)				
High and Less	69.90	48.89	57.39	64.47
BH & University[c]	24.72	37.78	31.02	27.52
University	5.38	13.33	11.59	8.02
Individual Income ($)	37,729	37,609	46,587	41,207
Family Income ($)	52,914	54,092	63,663	57,155
Number of Cases	1,132	48	764	1,944[d]
% of Cases	58.25	2.45	39.30	100

[a] Could not be classified as either managers or union members.
[b] Down, few if any moves, and don't know.
[c] Above high but below university.
[d] For the continuous variables of tenure, age, individual and family income, the number of cases is 1,959.

Table 3: Working Time by Selected Preretirement Work, Postretirement Work, and Individual Characteristics for Those Who were Interested in Post-Bell Employment, SWLA, 1995

	Un-employed	Fulltime Fullyear	Fulltime Partyear	Parttime Fullyear	Parttime Partyear	Self Employed	All
Preretirement Work Characteristics							
Tenure (Years)	28.60	33.16	32.32	32.88	32.79	33.18	32.70
Union Status (%)							
Manager	42.05	71.49	57.47	60.78	52.94	77.94	64.36
CTEA	29.55	7.44	10.34	12.37	16.41	2.94	10.69
CEP	22.73	13.22	20.69	19.43	19.20	13.97	17.05
Others	5.68	7.85	11.49	7.42	11.46	5.15	7.90
Job History (%)							
Up	15.91	10.33	18.39	18.02	17.03	13.48	15.09
Up and Across	42.05	62.81	58.62	53.71	50.46	67.65	58.07
Across	28.41	20.66	19.54	21.91	17.34	14.71	18.87
D, F, and DK	13.64	6.20	3.45	6.36	15.17	4.17	7.97
Postretirement Work Characteristics							
Occupation (%)							
Owner	0.00	2.52	2.41	0.72	1.99	25.45	8.97
Professional	0.00	19.75	27.71	7.94	9.27	29.52	18.25
Manager	0.00	26.47	18.07	13.72	8.61	18.07	16.47
Skilled	0.00	12.61	15.66	8.30	17.22	9.41	11.99
Unskilled	0.00	38.66	36.14	69.31	62.91	17.56	44.32
Industry (%)							
Other Services	0.00	41.15	35.90	11.49	28.19	26.23	26.93
Communications	0.00	31.42	26.92	37.55	29.53	32.51	32.30
Others[a]	0.00	27.43	37.18	50.96	42.28	41.26	40.76
Further Education (%)	11.36	24.38	18.09	18.02	26.63	24.26	22.43
Number of Jobs	0.00	1.74	2.09	1.65	1.72	1.91	1.68
Individual Characteristics							
Age (Years)	58.75	60.12	60.86	59.22	60.49	59.09	59.69
Age at Leaving (%)							
Below 50	11.36	9.92	12.64	10.25	6.50	12.75	10.27
50-55	36.36	49.59	39.08	48.76	45.82	51.47	51.47
56-60	31.82	29.75	34.48	36.04	37.77	31.86	33.82
Above 60	20.45	10.74	13.79	4.95	9.91	3.92	8.25
Visited Doctor (%)	80.68	81.82	68.21	83.04	84.52	78.92	82.04
Health Limitation (%)	23.86	18.60	19.54	18.73	16.72	15.69	17.75
Individual Income ($)	37,530	56,608	43,676	43,210	39,188	51,664	46,657
Family Income ($)	54,028	74,150	65,330	61,358	54,245	69,584	64,052
Female	35.23	17.36	24.14	27.56	36.53	8.33	22.64
Education (%)							
High and Less	47.73	50.83	54.02	68.55	65.02	45.83	56.11
BH & University	38.64	33.47	34.48	28.62	28.79	33.82	31.94
University	13.64	15.70	11.49	2.83	6.19	20.34	11.95
Community (%)							
Small	13.64	24.79	22.99	30.74	21.98	25.25	24.67
Medium	39.77	28.93	19.54	28.62	32.51	23.53	28.23
Large	46.59	46.28	57.47	40.64	45.51	51.23	47.10
Volunteer Activity (%)	54.55	44.21	37.93	55.12	59.75	59.31	54.44
Family Care (%)	9.09	14.05	5.75	10.25	15.48	10.78	11.88
Child Care (%)	17.05	13.64	20.69	14.49	10.22	16.42	14.47
Number of Cases	47	128	46	150	171	216	758[b]
% of cases	6.15	16.91	6.08	19.78	22.57	28.51	100

[a] Agriculture and other primary industries, manufacturing, construction, transportation, utilities, retail trade, finance, and health.

[b] For tenure, number of jobs, age, individual and family income, then number of cases is 789.

Table 4: Standard Employment, Paid Employment, and Unemployment Logit Estimates (absolute t-statistics in parentheses)

Variables	Standard Employment	Paid Employment	Unemployment
Preretirement Work Characteristics, the Centrality of Work, and the Decision to Leave			
Tenure	-0.002 (0.07)	-0.008 (0.32)	-0.009 (0.25)
Union Status [Manager]			
CTEA	0.007 (0.01)	0.364 (0.54)	2.218 (2.58)
CEP	0.102 (0.23)	-0.352 (0.99)	0.949 (1.56)
Others	0.163 (0.30)	0.181 (0.38)	1.417 (1.55)
Job Mobility [Up]			
Up and Across	1.136 (2.58)	0.212 (0.69)	-0.307 (0.50)
Across	1.314 (2.57)	0.256 (0.79)	-0.026 (0.04)
D, F, and DK	1.156 (2.45)	0.451 (0.82)	-0.216 (0.25)
Extrinsic Satisfaction	0.078 (0.28)	0.052 (0.24)	-0.214 (0.55)
Intrinsic Satisfaction	-0.623 (2.30)	-0.341 (1.58)	-0.024 (0.06)
Importance of Work	0.439 (2.22)	0.184 (1.16)	-0.007 (0.02)
Exit Incentive	0.157 (0.36)	-0.432 (1.20)	0.727 (1.06)
Reason for Leaving [Positive]			
Negative	-0.084 (0.26)	-0.193 (0.71)	0.662 (1.26)
New	3.120 (3.20)	-0.140 (0.22)	-
Others	0.023 (0.06)	-0.103 (0.35)	1.066 (1.90)
Postretirement Work Characteristics			
Occupation [Unskilled]			
Owner	0.891 (1.01)	-3.793 (8.16)	-
Professional	0.578 (1.35)	-2.051 (6.35)	-
Manager	0.950 (2.50)	-1.175 (3.84)	-
Skilled	0.431 (1.07)	-0.743 (2.11)	-
Industry [Other Services]			
Communications	0.753 (2.21)	1.013 (3.53)	-
Others	-0.425 (1.31)	0.097 (0.38)	-
Post-Bell Education	0.148 (0.47)	-0.007 (0.03)	-0.757 (1.34)
Individual and Family Characteristics			
Age at Leaving	0.191 (2.98)	0.055 (1.10)	-0.056 (0.67)
Left After Preferred Age	0.137 (0.47)	-0.304 (1.25)	-1.237 (2.57)
Visited Doctor	-0.026 (0.07)	0.297 (1.10)	0.626 (1.17)
Health Limitation	0.174 (0.51)	-0.025 (0.09)	-0.095 (0.18)
Own Home	-0.422 (1.31)	-0.033 (0.13)	0.346 (0.73)
Debt	0.380 (1.18)	0.196 (0.75)	-0.589 (1.15)
Investment Income	-0.109 (0.37)	-0.222 (0.88)	0.133 (0.31)
Current Income [Inadequate]			
Adequate	-0.218 (0.52)	-0.293 (0.81)	-0.325 (0.62)
Very Adequate	-0.306 (0.48)	-0.168 (0.35)	-1.013 (0.76)
Future Income [Inadequate]			
Adequate	0.596 (1.54)	0.103 (0.32)	-1.508 (3.18)
Very Adequate	0.335 (0.50)	-0.332 (0.70)	-1.521 (1.14)
Old Age Security	-0.676 (1.31)	-0.114 (0.28)	0.989 (1.38)
CPP/QPP	-1.601 (3.96)	-0.172 (0.56)	0.789 (1.26)
Female	-0.696 (1.54)	1.055 (2.60)	-0.276 (0.37)
Education [High and Less]			
BH & University	0.318 (1.09)	-0.211 (0.86)	0.527 (1.12)
University	1.261 (2.63)	-0.773 (2.21)	0.966 (1.44)
Community [Small]			
Medium	-0.331 (0.94)	0.354 (1.21)	1.369 (2.32)
Large	-0.646 (1.87)	0.099 (0.35)	1.106 (1.90)
Volunteer Activity	-0.518 (1.95)	-0.380 (1.72)	0.150 (0.36)
Married	0.453 (0.92)	-0.103 (0.26)	0.376 (0.54)
Working Spouse	0.135 (0.46)	0.120 (0.52)	-0.307 (0.68)
Family Care	0.261 (0.64)	-0.083 (0.24)	-1.034 (1.41)
Child Care	0.317 (0.84)	-0.509 (1.75)	0.495 (0.96)
Structural Characteristics			
Unemployment Rate	-0.143 (1.47)	0.031 (0.39)	-0.006 (0.04)
Consumer Price Index (1986=100)	0.020 (0.40)	0.038 (0.90)	0.026 (0.31)
Years Since Departure	0.217 (1.05)	0.206 (1.23)	-0.539 (1.89)
Intercept	-14.502 (2.02)	-5.738 (0.98)	-2.869 (0.23)
-2 Loglikelihood Ratio	418.19	616.33	216.85
Number of Cases	464	672	716

Table 5: Standard and Paid Employment Logit Estimates for Former Bell Managers (absolute t-statistics in parentheses)

Variables	Standard Employment	Paid Employment
Preretirement Work Characteristics, the Centrality of Work, and the Decision to Leave		
Tenure	0.084 (1.56)	-0.038 (1.09)
Job Mobility [Up]		
Up and Across	0.353 (0.67)	0.059 (0.16)
Across	0.237 (0.35)	0.202 (0.40)
D, F, and DK	1.032 (0.92)	-0.275 (0.33)
Extrinsic Satisfaction	-0.182 (0.52)	-0.184 (0.72)
Intrinsic Satisfaction	-0.379 (1.01)	-0.356 (1.40)
Importance of Work	0.442 (1.67)	0.241 (1.29)
Exit Incentive	-0.100 (0.14)	-0.736 (1.59)
Reason for Leaving [Positive]		
Negative	0.236 (0.53)	-0.226 (0.71)
New	0.939 (0.94)	0.151 (0.21)
Others	0.031 (0.06)	0.401 (1.08)
Postretirement Work Characteristics		
Occupation [Unskilled]		
Owner	1.815 (1.86)	-3.924 (7.46)
Professional	1.793 (3.27)	-2.341 (6.10)
Manager	1.715 (3.57)	-1.423 (3.93)
Skilled	0.937 (1.74)	-0.389 (0.89)
Industry [Other Services]		
Communications	-0.015 (0.03)	1.189 (3.57)
Others	-0.867 (1.87)	0.167 (0.52)
Post-Bell Education	-0.059 (0.15)	0.162 (0.55)
Individual and Family Characteristics		
Age at Leaving	0.115 (1.24)	0.085 (1.37)
Left After Preferred Age	0.170 (0.43)	-0.279 (0.97)
Visited Doctor	-0.190 (0.43)	0.295 (0.92)
Health Limitation	0.038 (0.08)	-0.174 (0.51)
Own Home	-0.709 (1.63)	-0.096 (0.30)
Debt	0.363 (0.80)	0.159 (0.50)
Investment Income	0.251 (0.61)	-0.446 (1.47)
Current Income [Inadequate]		
Adequate	-0.430 (0.71)	-0.238 (0.55)
Very Adequate	-0.359 (0.42)	-0.127 (0.23)
Future Income [Inadequate]		
Adequate	0.087 (0.16)	0.194 (0.50)
Very Adequate	-0.116 (0.14)	-0.183 (0.33)
Old Age Security	-1.315 (1.60)	-0.101 (0.20)
CPP/QPP	-1.518 (2.75)	-0.415 (1.14)
Female	-0.146 (0.25)	1.098 (2.17)
Education [High and Less]		
BH & University	-0.148 (0.39)	-0.214 (0.74)
University	1.481 (2.52)	-0.796 (2.11)
Community [Small]		
Medium	0.105 (0.21)	0.551 (1.56)
Large	-0.061 (0.12)	0.376 (1.12)
Volunteer Activity	-0.604 (1.77)	-0.442 (1.67)
Married	0.196 (0.30)	-0.263 (0.52)
Working Spouse	0.401 (1.01)	0.114 (0.41)
Family Care	0.284 (0.53)	-0.389 (0.99)
Child Care	1.012 (1.86)	-0.403 (1.08)
Structural Characteristics		
Unemployment Rate	-0.254 (1.88)	0.029 (0.31)
Consumer Price Index (1986=100)	0.0002 (0.003)	0.056 (1.04)
Years Since Departure	0.047 (0.16)	0.321 (1.48)
Intercept	-7.884 (0.79)	-7.850 (1.06)
-2 Loglikelihood Ratio	256.98	438.32
Number of Cases	283	448

Changes in Working Time in Canada and the United States.
June 13-15, 1996
Ottawa, Canada

KEYNOTE ADDRESS

Dinner, June 14, 1996

Rethinking Jobs, Work and Income:
The Imperative for a New Structure
by
Robert Theobald

Conference presented by:
The Canadian Employment Research Forum (CERF)
in cooperation with:
Human Resources Development Canada,
Statistics Canada, and the
W.E. Upjohn Institute for Employment Research.

Rethinking Jobs, Work and Income: The Imperative for a New Structure

Robert Theobald*

I am delighted to be here in Ottawa in the context of a serious effort to look at the issues of work and jobs. I am personally convinced that coming to grips with this issue is essential if we are to avoid serious breakdowns in the social order throughout the world. Full employment is currently an economic, psychological and cultural necessity: without it very serious trouble is inevitable.

We need to ask two fundamental questions. The first is what route can bring us back to full employment in the short run? The second, is what profound shifts in our mental pictures are essential in the foreseeable future and what degree of agreement could be achieved if we were willing to look at our current situation realistically?

There are at least three primary sets of voices at the current time. The first is clearly dominant in the media, in intellectual circles and in governments. It argues that the way ahead is through maximum growth, free markets and elimination of government deficits. Some of the partisans of this approach are increasingly willing to accept that we are going through a bad period. They vigorously deny, however, any need to make significant changes in current dynamics, arguing that the need is to stay the course.

The next set of voices point to the high unemployment rates in Europe and Australasia and the rapidly increasing inequality throughout the world. This group usually grows out of the left -wing tradition and social justice commitments. They believe that the commitment to social justice is being dramatically eroded. They are convinced that it is possible, and desirable, to recreate the full employment patterns which have developed in the twentieth century. They point to the many tasks and roles which are not being accomplished and which they argue could be achieved through better policies. Some recognize that major changes are required in the future but they see the bridging mechanism as a recommitment to increases in effective demand.

At one level, these two groups seem to be in great conflict. But I am just coming to recognize that at another they often both support the old conventional wisdom. They are willing to fight for victory using the same terms of debate. The argument is about **how** to achieve maximum growth -- its relevance and desirability are still taken for granted.

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The third group, to which I belong, agrees about the negative economic and social dynamics which are currently emerging. It does not believe, however, that it is possible to find any viable way ahead without a major, and extraordinarily rapid, shift in the way we think about production and consumption, work and income. This group searches for the relevant set of questions which may illuminate reality in the second half of the nineties. I find that a growing number of people are moving out of the first and second positions and toward the third stance.

The third group argues that human survival requires radical shifts in success criteria and patterns of reinforcement. It believes that it is necessary to make shifts as fundamental, or more fundamental, than those which took place as humanity moved out of the agricultural era into the industrial era. It also points out that the pace of change is now so great that the required shifts must take place within the lifetimes of those now alive rather than over several generations.

This group also recognizes the need to be political pragmatists. What direction, and consequent policies, could gain the consent of citizens? It is insufficient to be clear about the way ahead. A strategy which makes the way ahead clear to the public is also essential. I have the opportunity to give the 1996 Massey lectures. It is my hope that I can provide a realistic vision and also set up the patterns which will encourage dialogue around these fundamental shifts.

The nineties

There has been an extraordinary shift in the nature of the work and jobs debate since the beginning of the nineties. At the beginning of the decade, any attempt to introduce new ideas was easily, and widely, rejected as unnecessary and disruptive.

Today, the business journals are full of two types of story. One of them explores the shifts in the way work is getting done and points out that people must change how they prepare for careers if they are to have any chance of success. They also argue that work within companies is moving towards teaming and flexibility.

The other type of story explores a number of patterns which are seen as dangerous to the long-run strength of the capitalist society. The larger and larger gap which is opening up between the incomes of CEOs and the wages of workers is increasingly seen as an invitation to a populist backlash. The unwillingness of companies to share prosperity with their workers is also widely seen as both unjust and dangerous.

In the last eighteen months, business and governments throughout the world have begun to admit that there are indeed problems. The French government is arguing for significantly different directions. But the argument is still largely within the old context. It is claimed that if economic growth and free market

policies were vigorously pursued, the difficulties would rapidly vanish. In other words, the underlying premise is normally that our socioeconomic systems are going through a bad patch but there is no reason to believe it will continue.

The left, which has been losing ground in most countries, is trying to make a comeback. Unfortunately, most of the effort is devoted to proving how wrong the current strategies of business and government are without facing the rapidity of change. There is nevertheless some new thinking going on. I was fascinated to hear a labor leader say to me a few days ago that an effective coalition for social justice would necessarily require more than the unions.

As a result of the recognition that trends are changing, some people are beginning to look at old responses which have been largely forgotten for the last fifty years. Should we be considering reducing hours of work and/or limiting overtime? Are there ways in which jobs can be spread more widely without challenging the core commitments of late-twentieth-century capitalism? Is the way ahead to be found through cutting life-time hours of work rather than by striving for maximum employment?

The idea that it is the very concept of "jobs" and employment which is at the heart of our dilemma is, however, only now beginning to be considered. The thought that we need a far broader frame for our understandings is still essentially an emerging concept. People are not yet willing to admit that it is the very ways we strive for success which ensure that conditions continue to worsen.

This failure to broaden our patterns of thinking seems extraordinary to me for several reasons. First, the papers presented at this conference graphically show some emerging dramatic shifts, which many of us see as developing crises. For example, the increasing levels of income inequality, which now seem to be beyond statistical doubt in many countries , threaten the social contract which has held North American and European cultures together for so long. These are tied to the shifts in the patterns of work, and the fraying safety net, which are affecting some age-groups and classes more than others.

Second, there is growing understanding that the number of "jobs" is declining and that people will have to design "work" opportunities for themselves. Computers will be able, over time, to do all of the tasks which can be clearly defined. The rapidly growing levels of unemployment in most parts of the world show the dangers of persisting in a full employment rhetoric when it is unattainable within current patterns of thinking.

Those who want to argue that the world has changed dramatically must be able to explain the different patterns in the United States. Why has this country been able to avoid the rising unemployment emerging in the rest of the world? The United States is acting as though it is appropriate to have a system where full-time workers making the minimum wage are still deep in poverty and where workers have less and less economic and social protection. It is also employing far more people in middle-management positions -- 13% of non-farm workers in

the States are managerial and administrative employees compared to 4.2% of Japanese workers, 3.9% in Germany and 2.6% in Sweden.[1]

The costs of this increase in inequality have been largely obscured because of America's unwillingness to admit that there is a class problem in the country. For a person brought up in India and Europe, this was one of the biggest shocks I had when I came to the United States for the first time way back in the fifties. On my most cynical days, I wonder if the race debate is not supported because it prevents the poor from understanding their shared interests.

Japan's unemployment rate is also still apparently low. The tradition of life-long employment is, however, now crumbling. There are signs that when it does, the carnage may be very great for few people know how to cope with the stresses of an open market system. The Japanese have developed the skills to operate well within a closed system. In an open system, which is now developing, they may be far less effective.

Let me remind you in closing this section of the statistics which we all know so well. In most developed countries, unemployment rates are at 10% or above: the real rates are usually 50% above the official ones. This means that youth, and minorities, will experience unemployment rates of 20% and 30%.

In the developing countries, unemployment rates are typically above 25, 35 or even 50%. With a few dramatic exceptions, mainly in Asia, the pattern of development is such that the absorption of the unemployed is impossible, given that modern machinery is essential to compete on world markets and development patterns will not be labor intensive. Problems are worsened because the International Monetary Fund's policies continue to emphasize economic development and to ignore the consequent social results.

Is the growth model attractive -- or viable?

How do people support the belief that the current model can be continued into the future? The essential argument often comes down to the belief that jobs have always been created sufficiently rapidly in the past and nobody has yet been able to show that conditions today are really different from those of the past.

Let's look at this statement in more detail. What is really being argued is that while people have always been thrown out of work by productivity increases, new demand will inevitably emerge to enable those seeking employment to find jobs. It is accepted that there have been periods of recessions and slumps in the past but experience through the seventies seemed to suggest that downturns in the economy could be managed. The experience of the last fifteen years is increasingly recognized as different but it is presented as temporary.

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[1] David Gordon, **Fat and Mean: The Corporate Squeeze of Working Americans and the Myth of Managerial "Downsizing,** The Free Press, (1996) 336 pages.

But economists are ignoring the critical issue when they simply dismiss the possibility that we have entered into a profoundly different situation. The issue we must ask is where is the demand going to come from in the future?

Economists have successfully performed, until recently, an extraordinary trick. They have convinced people that the real question on which we should concentrate all our attention is how to increase production. In actual fact, the issue since the beginning of the industrial era has been how to use the stuff which could be produced.

In the post-World War II years, the answer to the dilemma has been found in encouraging consumption, through going into debt and by government expenditures. Today, all of these approaches are rapidly running out of steam. Consumption is static because of changing personal and social priorities in the rich countries and declining levels of income for most people. Credit limits are being reached because people feel maxed-out on credit cards and mortgages. Government expenditures are declining because of the commitment to reduce deficits. The question we therefore need to ask is whether there are suitable replacements for these driving forces or whether we have to rethink patterns completely.

The reality we must all face is that **if** we cannot provide jobs for everybody through increasing demand, then the socioeconomic order we have created over the last two hundred years is no longer viable. I am going to argue that we neither can, nor should, maintain a system which forces us to use goods and services which are not really needed by those who purchase them. Nor can we afford a system which is clearly creating ever greater levels of inequality because of its own internal logic.

It is important to raise a critical issue at this point. There is no shortage of work to be done. People everywhere are in need of companionship and care: older people, younger people, the sick and the dying all need far more support. Our cities are crumbling. The issue is not whether work is available. It is whether professionalism and jobs provide a context in which twenty-first century activities can be most successfully accomplished.

The first reason we must abandon the current system is that it may fall into a severe economic slump at any time. John Maynard Keynes proved that demand could fall below supply and stay there. We risk falling into a world-wide recession because of our inability to maintain well-paid jobs around the world. In addition, current levels of inequality tend to reduce demand because the rich save more than the poor and the level of effective demand can fall so far below the level of supply that the system collapses.

How close is this danger? I do not know and I do not believe anybody else does. Ignoring the possibility is, however, naive because the social safety nets which have so far prevented the fall in demand that would otherwise have been expected are now being removed. Every step in this direction increases the economic dangers.

The second reason for abandoning the current system is that I find it morally intolerable. I do not believe that it is right for some people to be multi-billionaires while others die from starvation. Economists, of which I am one, have conned us into believing that we earn what we are worth. This is complete nonsense in a world of differential power. I am, of course, aware that this statement raises hackles. Let us at least admit that there is an issue here which needs to be faced rather than assuming that the question is answered by economic theory.

In an open universe, which we used to believe we inhabited, it was possible to argue that one person having more did not mean that others would have less. In today's constrained universe, when some people own more than a fair share, others necessarily suffer. I am not arguing for absolute equality -- I am arguing that extremes of wealth and poverty should be unacceptable to us.

The third reason we must abandon the current approaches is that the tensions between the rich and the poor, as well as current levels of unemployment, are leading to high levels of anger. One sees this in the growing feelings of rage from the excluded groups in the rich countries. One sees it in the drive of people in the poor countries to share in the levels of wealth of the rich and their lack of understanding as to why this is not possible without unsustainable ecological damage. One sees it in growing movement of illegal immigrants from the poor to the rich countries and the backlash against them.

Finally, the model we are using is not ecologically feasible. This is the bullet that the rich countries have not yet been willing to bite. National and international government studies, with rare exceptions like the Netherlands, continue to argue that economic growth and long-run ecological viability can be combined. Hence the continued use of such oxymorons as "sustainable growth."

We must face the reality that economic growth in the rich countries must stop now and probably be reversed. Only in this way can we possibly provide enough potential opportunity for the poor countries to achieve reasonable standards for their populations. And it is only when the rich countries commit to full employment without growth that we can hope that the poor nations will recognize that their rates of population increase must also be decreased as rapidly as possible.

I recognize that there is still disagreement about the carrying capacity of the earth. But with some very rare exceptions, thinking people will accept that we shall reach these limits at some point and many are now arguing that we have already exceeded them. Prudence suggests that we should slow growth rates as quickly as possible rather than further endangering the quality of life of our children and grandchildren.

One problem in the world is clearly the rate of population increase. The poor countries are now prepared to accept help from the rich to find ways to bring

down birth rates. In the rich countries, the problem is clearly the rate of increase in artifacts. We should be willing to listen to the wisdom of those in the poor countries who have not bought into our own form of run-away growth. We have clearly not been willing to do this up to the current time.

If we do not get hold of the runaway increase in population and in artifacts, there can be no doubt that the socioeconomic system will collapse in the foreseeable future. We can already see the beginning evidence for this. For example, a new Genuine Progress Indicator has recently been developed for the United States. This shows that quality standards fell by 1% a year in the seventies, by 2% a year in the eighties and by 6% a year in the nineties. While the details of the construction of the indicator can certainly be challenged, its direction is almost certainly correct. The pattern it shows is probably replicated in other countries -- Statistics Canada is currently exploring this issue.

It is the ecological issue which, from my perspective, is the clincher. One can challenge my economic, moral and social perspectives, putting forward other pictures of reality. But I believe that the ecological issue cannot be realistically escaped or challenged.

Given what I've said so far, is it possible to recreate full employment by increasing demand as in the past? I simply don't know. I suspect that if the governments of the rich countries **did commit** to this strategy it could be achieved. It would mean abandoning the rhetorics which are now dominant -- each of us has to judge whether this could be done or not.

From my perspective, however, it is inappropriate to ask whether we **can** achieve full employment again by increasing demand. The right question is whether we **should** choose this route. My answer to this is an absolute "**no**." We must face the ecological imperatives now: the longer we wait the harsher the inevitable transitions. It is just possible to imagine a fairly desirable change process at the current time, The choices will become even more difficult the longer we wait.

Some argue that the necessity of respecting ecological constraints is not yet proved. The argument, as I understand it, has two possible aspects. One of them suggests that human beings do not need a natural environment and that, indeed, we must stop thinking of human beings as separate from their machine extensions. Another argues that we can escape from the natural environment and create our own through, for example, nanotechnologies.

Both of these arguments seem to me to be based on hubris: the worst of the sins. Those who think in this way believe that we are more powerful than we actually are. I believe we are part of a complex natural system which we cannot destroy but which can certainly destroy us if we should continue to ignore natural feedback loops.

The short run and medium run

In a democracy, proposals for changes in directions must be broadly accepted in order to be adopted. If, however, necessary changes are not made in a timely fashion the consequences are inevitably negative. The necessary ingredient is leadership and it is this factor which has been largely missing in recent years.

The problem is that the type of leadership we now require is quite different from that of the past. The challenge is to set people free to find their own responses. Attempts to limit the work-week to 32 hours by legislation will fail to achieve the desired goal: people can take second and third jobs. This result could only be prevented in a dictatorial state or if a new cultural norm emerged around issues of jobs, work and income.

We need to move in two directions. First, we need to remove certain built-in incentives to longer hours. Tax and benefit structures often make it more desirable for existing workers to do overtime rather than to hire additional people. Part-time workers are often exempt from tax and benefit systems required for those who work longer hours. Government policy should at least be neutral on these issues. It may need to tilt toward encouragement of policies which decrease hours.

Second, we need to recognize that there can be a vast number of work patterns which satisfy people. These are already emerging to a greater extent than is really understood. We need to encourage people, firms and communities to rethink the way they link needed tasks with people who want to feel they are making a real contribution.

I am totally convinced that it would be possible to achieve full employment by a voluntary reduction in hours of work if governments creatively supported this goal. One initial step which could be immediately politically feasible would be to turn around a recent cultural trend. In the not too distant past, it was expected that one parent would stay home to look after children when they were young. This pattern has changed for several reasons. One of them is the growing number of single parents.

When there are two-parent families, in many cases both parents want to have careers. This is a personal choice. Society should facilitate this choice. There has been some movement towards recognizing the needs of this type of family as compared to the image of the single-earner we inherited from the sixties.

There are, however, a very substantial proportion of dual-parent families where both parents are only working because they feel they cannot afford not to do so. There are a broad range of measures which could be developed to change the patterns here. In some cases, better information would help families see that the **net** additional income from a second wage-earner is relatively small -- it is sometimes even negative. In other cases there could be changes in corporate

and government funding practices which would place the successful raising of kids right at the heart of societal commitments.

I sometimes argue that middle-age is now the five days between getting one's children out of the nest and starting to support parents, aunts and uncles. The aging of the population has created a huge set of stressors which politicians and communities have largely ignored.

I believe that a political party could win an election if it were honest with voters. They are tired of pap and lies and dirty campaigning. People are ready to discuss the purposes of life. Where does work fit into a technological world? What should matter to people living in the twenty-first century? What are their responsibilities to society?

Where to next? Rethinking success criteria and reinforcement models.

If we accept that we do need to move in different directions, what then are the immediate research and action agendas?

I believe there are two generic questions with which we need to deal. The first is to reduce the average number of hours of work that people choose or are expected to be in the labor force in their lifetimes. Instead of working toward increases in labor force participation rates, more hours, etc., we should be moving in the opposite direction so we can take advantage of the productivity of machines.

There are lots of ideas available here. Many of them were expressed in a 1994 Canadian report from the federal government Advisory Group on Working Time and the Distribution of Work. It proposed changed public policy priorities that would enable the redistribution and reduction of working time. It also urged employers, trade unions and employees to place more emphasis on working-time issues and their implications in collective bargaining and workplace decision-making. Some of the proposals were to limit overtime, to limit loopholes in workforce protection for those outside standard workplaces, to ensure that part-time employees get benefits, to rethink retirement policies so that the shift out of jobs be more gradual, and to ensure that education persisted throughout life.

The second challenge is to encourage or enable people to move away from placing consumption at the center of their lives. There's a lot going on in fields like downshifting although the culture is still not very aware of the energy around this idea and its potentials. **Downshifting** is the term which has been chosen, perhaps unhappily, to express a commitment to voluntary simplicity and living lightly.

What should we be doing? First, we should be collecting information on programs which are currently developing in these two areas. Second, we

should research what the impacts of decreasing life-time hours of work and commitments to consumption are at every level from the most obvious to the most subtle.

The third challenge is the most difficult. The current mind-set which denies us the right to think in any other terms but international competitiveness must be destroyed. We must somehow get to the point where we recognize that the goals to which society has committed are not those which will provide satisfaction to citizens nor long-run survival to the people on the planet.

I am an economist. I know that fighting the market is dumb. I also know that markets ought to be constrained by societies both in terms of what is for "sale" and also in terms of the place of economic issues as compared to cultural. I wrote a book in 1963 called "Free Men and Free Markets." I apologize for the wording but I stick by the thought.

The need for new socioeconomic thinking

The issues I have so far raised are, however, only the tip of the iceberg. The real questions go much deeper and raise all sorts of taboos which we have brushed under the carpet in recent years and decades. There is almost no questions which do not need to be reopened and rethought. Here are some of those I personally see as most important:

Given that we cannot own nature, what should our relationship to her be? Do we need to go back to the concept of **usufruct** by which people have the right to benefit from her bounty but the responsibility to ensure that she is passed on undamaged to the next generation?

Once we open up the question of ownership of nature, we are necessarily led to ask questions about the ownership of capital. Who should own capital? It seems clear that the rules should change in a world where we are aware of inevitable ecological limitations rather than acting as though there are open frontiers. Ideas about profit-sharing, worker ownership, etc. approach this issue, but gingerly.

In the middle ages, we abandoned a basic religious tenet which denied the right of those who owned capital to earn interest from loans for consumption purposes, (Please note my distinction between loans for consumption and investment purposes.) Did we make a fundamental mistake when we allowed what would have, in those days, been called usury?

In the nineteenth century, we developed a structure of law which permitted corporations to be seen as having the rights of people. Is it time that we reined in corporations and insisted that they serve people and ecological systems? This issue is being raised by the challenges to Shell and other corporations which have lost battles they clearly expected to win.

In the middle ages, we developed a right to own ideas. Given the patterns now developing with the world-wide-web and the internet, where it is clear that ideas emerge from the ether, do we need to revisit this issue? The attempts to preserve copyright are getting in the way of knowledge creation to a greater and greater extent. If we do change in this area, we shall also have to shift our thinking about reward systems dramatically.

How do we decide which decisions are made at the neighborhood, community, bioregional, national and global level? Some argue for placing decision-making as close to people as possible, some want to move power to the global level.

All of the above issues impact on what is perhaps the most urgent issue of the next few years. If more and more people cannot obtain a reasonable income from jobs, because of the ever-growing impact of computers, then what basis can we devise which will give them rights to resources? Part of the answer will come from decreasing life-time hours of work for all, resulting in the sharing of jobs among more people. But there are many problems which cannot be resolved in this way.

I used to hope that there was a simple answer to this question. It is now clear that the search for relevant responses will force us to face the issues we have largely ignored in recent decades, and even centuries. We shall have to face, above all, the question of what is the purpose of life and what is the essential nature of all organisms, including man. Is nature "red in tooth and claw?" Or is there a higher cooperative order to which we all can strive?

In the short run, there are three fundamental questions we must answer as societies -- all of which are extraordinarily tricky. The answers depend in part on research but to a far larger extent on our values orientation. First, do we have a commitment to care for those who cannot look after themselves? And what are the limits to this commitment?

What responsibilities do people have to fulfill, if any, in order to receive support from the society? In the sixties, we developed a model which said that rights were absolutes. Today the pendulum is swinging. Where do we want it to come to rest?

Finally, where does the responsibility for support rest? If it is at the **global** level, then we need to increase dramatically intelligent transfers of resources, recognizing that much foreign aid has so far been counterproductive. If it is at the **national** level, then it is appropriate to move resources from rich provinces and states to poor ones. Or is the commitment to be taken at the provincial or state level which leads to transfers within this level of government? Finally we can think about communities or even neighborhoods.

The issue which must be remembered in all these discussions is the question of limits. If the environment is already a real constraint, does this alter the way we see transfer issues?

I am convinced that our only hope for the future depends on acting as though social systems can be created to encourage most human beings to develop themselves and others most of the time. Hope is out of fashion these days. But without hope and vision the people still perish. The issues I raise above, and many others, must be reopened with commitment, courage and compassion if we are not to fall back into a second dark ages.

Research priorities

I have opened up a very broad canvas in the last few minutes. Now let me come back to subjects which are directly relevant to the primary concerns of many of you at this conference.

What is happening to labor force participation rates at the current time? What do they tell us about emerging labor force patterns? We can learn far more about what is going on by looking at labor force participation rates as well as unemployment rates. What is happening to inequality? Can we group countries in some meaningful way according to their emerging patterns?

What do we know about patterns of work when people make their own choices as compared to those where they are told to do things by others? In other words, what do we know about the relative effectiveness of systems which are based on freedom to be creative and imaginative as opposed to controlled systems? Most of the material I have seen has been anecdotal.

How can we improve our thinking about the carrying capacity of the earth? Why are the estimates of how many human beings, and how much production, can be supported so terribly far apart? Is the primary source of the difficulty that people bring different ideological visions or that the data are inadequate or ...

Would a return to the concept of usufruct, rather than ownership, be relevant? What does the anthropological record tell us? What is the way to avoid the tragedy of the commons in an increasingly crowded world? Is there a risk that this tragedy will spread to the information universe? To what extent is it true that when information doubles, knowledge halves and wisdom quarters?

What do we know about life cycles? How much have they changed? How do we get people to recognize that the world in which we live is incredibly far from the stereotypes with which we grew up but which still dominate much political and intellectual discussion?

What forms of measurement do we need to move away from the distortions imposed by GDP? What do we want to measure? And, perhaps as importantly, how do we recognize that there are critical issues which cannot be effectively measured and that attempts to measure them are in themselves destructive? In other words, how do we recognize one primary pathology of modern societies -- that if it cannot be measured it is assumed not to exist.

John Cage once announced that "Measurement measure measuring means." I take this to mean that what we measure is more important than what the measurements show. I hope that one of the consequences of this conference will be to shift the emphasis to directions which will be more appropriate to the new world in which we live.

There is growing agreement that the strategies we have inherited from the past no longer provide desired results. But like the QWERTY typewriter, they stick around. It is surely time to be imaginative at two levels.

One of them is to develop better measures. Those of you at this conference have the special capacities to play a major role in this area.

The other is to find ways to get people to listen to what the new measures show and to look at our societies in new ways, including those which cannot be supported by new measures. This is the area in which I spend most of my time. I'd like to invite your support. We shall use the 1996 Canadian Broadcasting Corporation's Massey lectures, which I have been invited to give, as a way of opening up the issues which I have been able to discuss briefly with you today for a broad audience. I'd welcome your energy as part of this effort.

One of my profound concerns for many years is that almost all of our research and action has gone to support the current structures of the economy and the society. The work you are currently doing shows that this situation is already shifting. It is my hope that you will leave this meeting even more committed to changing research and action patterns.

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Rethinking Jobs, Work and Income: The Imperative for a New Structure

Robert Theobald*

I am delighted to be here in Ottawa in the context of a serious effort to look at the issues of work and jobs. I am personally convinced that coming to grips with this issue is essential if we are to avoid serious breakdowns in the social order throughout the world. Full employment is currently an economic, psychological and cultural necessity: without it very serious trouble is inevitable.

We need to ask two fundamental questions. The first is what route can bring us back to full employment in the short run? The second, is what profound shifts in our mental pictures are essential in the foreseeable future and what degree of agreement could be achieved if we were willing to look at our current situation realistically?

There are at least three primary sets of voices at the current time. The first is clearly dominant in the media, in intellectual circles and in governments. It argues that the way ahead is through maximum growth, free markets and elimination of government deficits. Some of the partisans of this approach are increasingly willing to accept that we are going through a bad period. They vigorously deny, however, any need to make significant changes in current dynamics, arguing that the need is to stay the course.

The next set of voices point to the high unemployment rates in Europe and Australasia and the rapidly increasing inequality throughout the world. This group usually grows out of the left -wing tradition and social justice commitments. They believe that the commitment to social justice is being dramatically eroded. They are convinced that it is possible, and desirable, to recreate the full employment patterns which have developed in the twentieth century. They point to the many tasks and roles which are not being accomplished and which they argue could be achieved through better policies. Some recognize that major changes are required in the future but they see the bridging mechanism as a recommitment to increases in effective demand.

At one level, these two groups seem to be in great conflict. But I am just coming to recognize that at another they often both support the old conventional wisdom. They are willing to fight for victory using the same terms of debate. The argument is about **how** to achieve maximum growth -- its relevance and desirability are still taken for granted.

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The third group, to which I belong, agrees about the negative economic and social dynamics which are currently emerging. It does not believe, however, that it is possible to find any viable way ahead without a major, and extraordinarily rapid, shift in the way we think about production and consumption, work and income. This group searches for the relevant set of questions which may illuminate reality in the second half of the nineties. I find that a growing number of people are moving out of the first and second positions and toward the third stance.

The third group argues that human survival requires radical shifts in success criteria and patterns of reinforcement. It believes that it is necessary to make shifts as fundamental, or more fundamental, than those which took place as humanity moved out of the agricultural era into the industrial era. It also points out that the pace of change is now so great that the required shifts must take place within the lifetimes of those now alive rather than over several generations.

This group also recognizes the need to be political pragmatists. What direction, and consequent policies, could gain the consent of citizens? It is insufficient to be clear about the way ahead. A strategy which makes the way ahead clear to the public is also essential. I have the opportunity to give the 1996 Massey lectures. It is my hope that I can provide a realistic vision and also set up the patterns which will encourage dialogue around these fundamental shifts.

The nineties

There has been an extraordinary shift in the nature of the work and jobs debate since the beginning of the nineties. At the beginning of the decade, any attempt to introduce new ideas was easily, and widely, rejected as unnecessary and disruptive.

Today, the business journals are full of two types of story. One of them explores the shifts in the way work is getting done and points out that people must change how they prepare for careers if they are to have any chance of success. They also argue that work within companies is moving towards teaming and flexibility.

The other type of story explores a number of patterns which are seen as dangerous to the long-run strength of the capitalist society. The larger and larger gap which is opening up between the incomes of CEOs and the wages of workers is increasingly seen as an invitation to a populist backlash. The unwillingness of companies to share prosperity with their workers is also widely seen as both unjust and dangerous.

In the last eighteen months, business and governments throughout the world have begun to admit that there are indeed problems. The French government is arguing for significantly different directions. But the argument is still largely within the old context. It is claimed that if economic growth and free market

policies were vigorously pursued, the difficulties would rapidly vanish. In other words, the underlying premise is normally that our socioeconomic systems are going through a bad patch but there is no reason to believe it will continue.

The left, which has been losing ground in most countries, is trying to make a comeback. Unfortunately, most of the effort is devoted to proving how wrong the current strategies of business and government are without facing the rapidity of change. There is nevertheless some new thinking going on. I was fascinated to hear a labor leader say to me a few days ago that an effective coalition for social justice would necessarily require more than the unions.

As a result of the recognition that trends are changing, some people are beginning to look at old responses which have been largely forgotten for the last fifty years. Should we be considering reducing hours of work and/or limiting overtime? Are there ways in which jobs can be spread more widely without challenging the core commitments of late-twentieth-century capitalism? Is the way ahead to be found through cutting life-time hours of work rather than by striving for maximum employment?

The idea that it is the very concept of "jobs" and employment which is at the heart of our dilemma is, however, only now beginning to be considered. The thought that we need a far broader frame for our understandings is still essentially an emerging concept. People are not yet willing to admit that it is the very ways we strive for success which ensure that conditions continue to worsen.

This failure to broaden our patterns of thinking seems extraordinary to me for several reasons. First, the papers presented at this conference graphically show some emerging dramatic shifts, which many of us see as developing crises. For example, the increasing levels of income inequality, which now seem to be beyond statistical doubt in many countries , threaten the social contract which has held North American and European cultures together for so long. These are tied to the shifts in the patterns of work, and the fraying safety net, which are affecting some age-groups and classes more than others.

Second, there is growing understanding that the number of "jobs" is declining and that people will have to design "work" opportunities for themselves. Computers will be able, over time, to do all of the tasks which can be clearly defined. The rapidly growing levels of unemployment in most parts of the world show the dangers of persisting in a full employment rhetoric when it is unattainable within current patterns of thinking.

Those who want to argue that the world has changed dramatically must be able to explain the different patterns in the United States. Why has this country been able to avoid the rising unemployment emerging in the rest of the world? The United States is acting as though it is appropriate to have a system where full-time workers making the minimum wage are still deep in poverty and where workers have less and less economic and social protection. It is also employing far more people in middle-management positions -- 13% of non-farm workers in

the States are managerial and administrative employees compared to 4.2% of Japanese workers, 3.9% in Germany and 2.6% in Sweden.[1]

The costs of this increase in inequality have been largely obscured because of America's unwillingness to admit that there is a class problem in the country. For a person brought up in India and Europe, this was one of the biggest shocks I had when I came to the United States for the first time way back in the fifties. On my most cynical days, I wonder if the race debate is not supported because it prevents the poor from understanding their shared interests.

Japan's unemployment rate is also still apparently low. The tradition of life-long employment is, however, now crumbling. There are signs that when it does, the carnage may be very great for few people know how to cope with the stresses of an open market system. The Japanese have developed the skills to operate well within a closed system. In an open system, which is now developing, they may be far less effective.

Let me remind you in closing this section of the statistics which we all know so well. In most developed countries, unemployment rates are at 10% or above: the real rates are usually 50% above the official ones. This means that youth, and minorities, will experience unemployment rates of 20% and 30%.

In the developing countries, unemployment rates are typically above 25, 35 or even 50%. With a few dramatic exceptions, mainly in Asia, the pattern of development is such that the absorption of the unemployed is impossible, given that modern machinery is essential to compete on world markets and development patterns will not be labor intensive. Problems are worsened because the International Monetary Fund's policies continue to emphasize economic development and to ignore the consequent social results.

Is the growth model attractive -- or viable?

How do people support the belief that the current model can be continued into the future? The essential argument often comes down to the belief that jobs have always been created sufficiently rapidly in the past and nobody has yet been able to show that conditions today are really different from those of the past.

Let's look at this statement in more detail. What is really being argued is that while people have always been thrown out of work by productivity increases, new demand will inevitably emerge to enable those seeking employment to find jobs. It is accepted that there have been periods of recessions and slumps in the past but experience through the seventies seemed to suggest that downturns in the economy could be managed. The experience of the last fifteen years is increasingly recognized as different but it is presented as temporary.

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[1] David Gordon, **Fat and Mean: The Corporate Squeeze of Working Americans and the Myth of Managerial "Downsizing,** The Free Press, (1996) 336 pages.

But economists are ignoring the critical issue when they simply dismiss the possibility that we have entered into a profoundly different situation. The issue we must ask is where is the demand going to come from in the future?

Economists have successfully performed, until recently, an extraordinary trick. They have convinced people that the real question on which we should concentrate all our attention is how to increase production. In actual fact, the issue since the beginning of the industrial era has been how to use the stuff which could be produced.

In the post-World War II years, the answer to the dilemma has been found in encouraging consumption, through going into debt and by government expenditures. Today, all of these approaches are rapidly running out of steam. Consumption is static because of changing personal and social priorities in the rich countries and declining levels of income for most people. Credit limits are being reached because people feel maxed-out on credit cards and mortgages. Government expenditures are declining because of the commitment to reduce deficits. The question we therefore need to ask is whether there are suitable replacements for these driving forces or whether we have to rethink patterns completely.

The reality we must all face is that **if** we cannot provide jobs for everybody through increasing demand, then the socioeconomic order we have created over the last two hundred years is no longer viable. I am going to argue that we neither can, nor should, maintain a system which forces us to use goods and services which are not really needed by those who purchase them. Nor can we afford a system which is clearly creating ever greater levels of inequality because of its own internal logic.

It is important to raise a critical issue at this point. There is no shortage of work to be done. People everywhere are in need of companionship and care: older people, younger people, the sick and the dying all need far more support. Our cities are crumbling. The issue is not whether work is available. It is whether professionalism and jobs provide a context in which twenty-first century activities can be most successfully accomplished.

The first reason we must abandon the current system is that it may fall into a severe economic slump at any time. John Maynard Keynes proved that demand could fall below supply and stay there. We risk falling into a world-wide recession because of our inability to maintain well-paid jobs around the world. In addition, current levels of inequality tend to reduce demand because the rich save more than the poor and the level of effective demand can fall so far below the level of supply that the system collapses.

How close is this danger? I do not know and I do not believe anybody else does. Ignoring the possibility is, however, naive because the social safety nets which have so far prevented the fall in demand that would otherwise have been expected are now being removed. Every step in this direction increases the economic dangers.

The second reason for abandoning the current system is that I find it morally intolerable. I do not believe that it is right for some people to be multi-billionaires while others die from starvation. Economists, of which I am one, have conned us into believing that we earn what we are worth. This is complete nonsense in a world of differential power. I am, of course, aware that this statement raises hackles. Let us at least admit that there is an issue here which needs to be faced rather than assuming that the question is answered by economic theory.

In an open universe, which we used to believe we inhabited, it was possible to argue that one person having more did not mean that others would have less. In today's constrained universe, when some people own more than a fair share, others necessarily suffer. I am not arguing for absolute equality -- I am arguing that extremes of wealth and poverty should be unacceptable to us.

The third reason we must abandon the current approaches is that the tensions between the rich and the poor, as well as current levels of unemployment, are leading to high levels of anger. One sees this in the growing feelings of rage from the excluded groups in the rich countries. One sees it in the drive of people in the poor countries to share in the levels of wealth of the rich and their lack of understanding as to why this is not possible without unsustainable ecological damage. One sees it in growing movement of illegal immigrants from the poor to the rich countries and the backlash against them.

Finally, the model we are using is not ecologically feasible. This is the bullet that the rich countries have not yet been willing to bite. National and international government studies, with rare exceptions like the Netherlands, continue to argue that economic growth and long-run ecological viability can be combined. Hence the continued use of such oxymorons as "sustainable growth."

We must face the reality that economic growth in the rich countries must stop now and probably be reversed. Only in this way can we possibly provide enough potential opportunity for the poor countries to achieve reasonable standards for their populations. And it is only when the rich countries commit to full employment without growth that we can hope that the poor nations will recognize that their rates of population increase must also be decreased as rapidly as possible.

I recognize that there is still disagreement about the carrying capacity of the earth. But with some very rare exceptions, thinking people will accept that we shall reach these limits at some point and many are now arguing that we have already exceeded them. Prudence suggests that we should slow growth rates as quickly as possible rather than further endangering the quality of life of our children and grandchildren.

One problem in the world is clearly the rate of population increase. The poor countries are now prepared to accept help from the rich to find ways to bring

down birth rates. In the rich countries, the problem is clearly the rate of increase in artifacts. We should be willing to listen to the wisdom of those in the poor countries who have not bought into our own form of run-away growth. We have clearly not been willing to do this up to the current time.

If we do not get hold of the runaway increase in population and in artifacts, there can be no doubt that the socioeconomic system will collapse in the foreseeable future. We can already see the beginning evidence for this. For example, a new Genuine Progress Indicator has recently been developed for the United States. This shows that quality standards fell by 1% a year in the seventies, by 2% a year in the eighties and by 6% a year in the nineties. While the details of the construction of the indicator can certainly be challenged, its direction is almost certainly correct. The pattern it shows is probably replicated in other countries -- Statistics Canada is currently exploring this issue.

It is the ecological issue which, from my perspective, is the clincher. One can challenge my economic, moral and social perspectives, putting forward other pictures of reality. But I believe that the ecological issue cannot be realistically escaped or challenged.

Given what I've said so far, is it possible to recreate full employment by increasing demand as in the past? I simply don't know. I suspect that if the governments of the rich countries **did commit** to this strategy it could be achieved. It would mean abandoning the rhetorics which are now dominant -- each of us has to judge whether this could be done or not.

From my perspective, however, it is inappropriate to ask whether we **can** achieve full employment again by increasing demand. The right question is whether we **should** choose this route. My answer to this is an absolute "**no**." We must face the ecological imperatives now: the longer we wait the harsher the inevitable transitions. It is just possible to imagine a fairly desirable change process at the current time, The choices will become even more difficult the longer we wait.

Some argue that the necessity of respecting ecological constraints is not yet proved. The argument, as I understand it, has two possible aspects. One of them suggests that human beings do not need a natural environment and that, indeed, we must stop thinking of human beings as separate from their machine extensions. Another argues that we can escape from the natural environment and create our own through, for example, nanotechnologies.

Both of these arguments seem to me to be based on hubris: the worst of the sins. Those who think in this way believe that we are more powerful than we actually are. I believe we are part of a complex natural system which we cannot destroy but which can certainly destroy us if we should continue to ignore natural feedback loops.

The short run and medium run

In a democracy, proposals for changes in directions must be broadly accepted in order to be adopted. If, however, necessary changes are not made in a timely fashion the consequences are inevitably negative. The necessary ingredient is leadership and it is this factor which has been largely missing in recent years.

The problem is that the type of leadership we now require is quite different from that of the past. The challenge is to set people free to find their own responses. Attempts to limit the work-week to 32 hours by legislation will fail to achieve the desired goal: people can take second and third jobs. This result could only be prevented in a dictatorial state or if a new cultural norm emerged around issues of jobs, work and income.

We need to move in two directions. First, we need to remove certain built-in incentives to longer hours. Tax and benefit structures often make it more desirable for existing workers to do overtime rather than to hire additional people. Part-time workers are often exempt from tax and benefit systems required for those who work longer hours. Government policy should at least be neutral on these issues. It may need to tilt toward encouragement of policies which decrease hours.

Second, we need to recognize that there can be a vast number of work patterns which satisfy people. These are already emerging to a greater extent than is really understood. We need to encourage people, firms and communities to rethink the way they link needed tasks with people who want to feel they are making a real contribution.

I am totally convinced that it would be possible to achieve full employment by a voluntary reduction in hours of work if governments creatively supported this goal. One initial step which could be immediately politically feasible would be to turn around a recent cultural trend. In the not too distant past, it was expected that one parent would stay home to look after children when they were young. This pattern has changed for several reasons. One of them is the growing number of single parents.

When there are two-parent families, in many cases both parents want to have careers. This is a personal choice. Society should facilitate this choice. There has been some movement towards recognizing the needs of this type of family as compared to the image of the single-earner we inherited from the sixties.

There are, however, a very substantial proportion of dual-parent families where both parents are only working because they feel they cannot afford not to do so. There are a broad range of measures which could be developed to change the patterns here. In some cases, better information would help families see that the **net** additional income from a second wage-earner is relatively small -- it is sometimes even negative. In other cases there could be changes in corporate

and government funding practices which would place the successful raising of kids right at the heart of societal commitments.

I sometimes argue that middle-age is now the five days between getting one's children out of the nest and starting to support parents, aunts and uncles. The aging of the population has created a huge set of stressors which politicians and communities have largely ignored.

I believe that a political party could win an election if it were honest with voters. They are tired of pap and lies and dirty campaigning. People are ready to discuss the purposes of life. Where does work fit into a technological world? What should matter to people living in the twenty-first century? What are their responsibilities to society?

Where to next? Rethinking success criteria and reinforcement models.

If we accept that we do need to move in different directions, what then are the immediate research and action agendas?

I believe there are two generic questions with which we need to deal. The first is to reduce the average number of hours of work that people choose or are expected to be in the labor force in their lifetimes. Instead of working toward increases in labor force participation rates, more hours, etc., we should be moving in the opposite direction so we can take advantage of the productivity of machines.

There are lots of ideas available here. Many of them were expressed in a 1994 Canadian report from the federal government Advisory Group on Working Time and the Distribution of Work. It proposed changed public policy priorities that would enable the redistribution and reduction of working time. It also urged employers, trade unions and employees to place more emphasis on working-time issues and their implications in collective bargaining and workplace decision-making. Some of the proposals were to limit overtime, to limit loopholes in workforce protection for those outside standard workplaces, to ensure that part-time employees get benefits, to rethink retirement policies so that the shift out of jobs be more gradual, and to ensure that education persisted throughout life.

The second challenge is to encourage or enable people to move away from placing consumption at the center of their lives. There's a lot going on in fields like downshifting although the culture is still not very aware of the energy around this idea and its potentials. **Downshifting** is the term which has been chosen, perhaps unhappily, to express a commitment to voluntary simplicity and living lightly.

What should we be doing? First, we should be collecting information on programs which are currently developing in these two areas. Second, we

should research what the impacts of decreasing life-time hours of work and commitments to consumption are at every level from the most obvious to the most subtle.

The third challenge is the most difficult. The current mind-set which denies us the right to think in any other terms but international competitiveness must be destroyed. We must somehow get to the point where we recognize that the goals to which society has committed are not those which will provide satisfaction to citizens nor long-run survival to the people on the planet.

I am an economist. I know that fighting the market is dumb. I also know that markets ought to be constrained by societies both in terms of what is for "sale" and also in terms of the place of economic issues as compared to cultural. I wrote a book in 1963 called "Free Men and Free Markets." I apologize for the wording but I stick by the thought.

The need for new socioeconomic thinking

The issues I have so far raised are, however, only the tip of the iceberg. The real questions go much deeper and raise all sorts of taboos which we have brushed under the carpet in recent years and decades. There is almost no questions which do not need to be reopened and rethought. Here are some of those I personally see as most important:

Given that we cannot own nature, what should our relationship to her be? Do we need to go back to the concept of **usufruct** by which people have the right to benefit from her bounty but the responsibility to ensure that she is passed on undamaged to the next generation?

Once we open up the question of ownership of nature, we are necessarily led to ask questions about the ownership of capital. Who should own capital? It seems clear that the rules should change in a world where we are aware of inevitable ecological limitations rather than acting as though there are open frontiers. Ideas about profit-sharing, worker ownership, etc. approach this issue, but gingerly.

In the middle ages, we abandoned a basic religious tenet which denied the right of those who owned capital to earn interest from loans for consumption purposes, (Please note my distinction between loans for consumption and investment purposes.) Did we make a fundamental mistake when we allowed what would have, in those days, been called usury?

In the nineteenth century, we developed a structure of law which permitted corporations to be seen as having the rights of people. Is it time that we reined in corporations and insisted that they serve people and ecological systems? This issue is being raised by the challenges to Shell and other corporations which have lost battles they clearly expected to win.

In the middle ages, we developed a right to own ideas. Given the patterns now developing with the world-wide-web and the internet, where it is clear that ideas emerge from the ether, do we need to revisit this issue? The attempts to preserve copyright are getting in the way of knowledge creation to a greater and greater extent. If we do change in this area, we shall also have to shift our thinking about reward systems dramatically.

How do we decide which decisions are made at the neighborhood, community, bioregional, national and global level? Some argue for placing decision-making as close to people as possible, some want to move power to the global level.

All of the above issues impact on what is perhaps the most urgent issue of the next few years. If more and more people cannot obtain a reasonable income from jobs, because of the ever-growing impact of computers, then what basis can we devise which will give them rights to resources? Part of the answer will come from decreasing life-time hours of work for all, resulting in the sharing of jobs among more people. But there are many problems which cannot be resolved in this way.

I used to hope that there was a simple answer to this question. It is now clear that the search for relevant responses will force us to face the issues we have largely ignored in recent decades, and even centuries. We shall have to face, above all, the question of what is the purpose of life and what is the essential nature of all organisms, including man. Is nature "red in tooth and claw?" Or is there a higher cooperative order to which we all can strive?

In the short run, there are three fundamental questions we must answer as societies -- all of which are extraordinarily tricky. The answers depend in part on research but to a far larger extent on our values orientation. First, do we have a commitment to care for those who cannot look after themselves? And what are the limits to this commitment?

What responsibilities do people have to fulfill, if any, in order to receive support from the society? In the sixties, we developed a model which said that rights were absolutes. Today the pendulum is swinging. Where do we want it to come to rest?

Finally, where does the responsibility for support rest? If it is at the **global** level, then we need to increase dramatically intelligent transfers of resources, recognizing that much foreign aid has so far been counterproductive. If it is at the **national** level, then it is appropriate to move resources from rich provinces and states to poor ones. Or is the commitment to be taken at the provincial or state level which leads to transfers within this level of government? Finally we can think about communities or even neighborhoods.

The issue which must be remembered in all these discussions is the question of limits. If the environment is already a real constraint, does this alter the way we see transfer issues?

I am convinced that our only hope for the future depends on acting as though social systems can be created to encourage most human beings to develop themselves and others most of the time. Hope is out of fashion these days. But without hope and vision the people still perish. The issues I raise above, and many others, must be reopened with commitment, courage and compassion if we are not to fall back into a second dark ages.

Research priorities

I have opened up a very broad canvas in the last few minutes. Now let me come back to subjects which are directly relevant to the primary concerns of many of you at this conference.

What is happening to labor force participation rates at the current time? What do they tell us about emerging labor force patterns? We can learn far more about what is going on by looking at labor force participation rates as well as unemployment rates. What is happening to inequality? Can we group countries in some meaningful way according to their emerging patterns?

What do we know about patterns of work when people make their own choices as compared to those where they are told to do things by others? In other words, what do we know about the relative effectiveness of systems which are based on freedom to be creative and imaginative as opposed to controlled systems? Most of the material I have seen has been anecdotal.

How can we improve our thinking about the carrying capacity of the earth? Why are the estimates of how many human beings, and how much production, can be supported so terribly far apart? Is the primary source of the difficulty that people bring different ideological visions or that the data are inadequate or ...

Would a return to the concept of usufruct, rather than ownership, be relevant? What does the anthropological record tell us? What is the way to avoid the tragedy of the commons in an increasingly crowded world? Is there a risk that this tragedy will spread to the information universe? To what extent is it true that when information doubles, knowledge halves and wisdom quarters?

What do we know about life cycles? How much have they changed? How do we get people to recognize that the world in which we live is incredibly far from the stereotypes with which we grew up but which still dominate much political and intellectual discussion?

What forms of measurement do we need to move away from the distortions imposed by GDP? What do we want to measure? And, perhaps as importantly, how do we recognize that there are critical issues which cannot be effectively measured and that attempts to measure them are in themselves destructive? In other words, how do we recognize one primary pathology of modern societies -- that if it cannot be measured it is assumed not to exist.

John Cage once announced that "Measurement measure measuring means." I take this to mean that what we measure is more important than what the measurements show. I hope that one of the consequences of this conference will be to shift the emphasis to directions which will be more appropriate to the new world in which we live.

There is growing agreement that the strategies we have inherited from the past no longer provide desired results. But like the QWERTY typewriter, they stick around. It is surely time to be imaginative at two levels.

One of them is to develop better measures. Those of you at this conference have the special capacities to play a major role in this area.

The other is to find ways to get people to listen to what the new measures show and to look at our societies in new ways, including those which cannot be supported by new measures. This is the area in which I spend most of my time. I'd like to invite your support. We shall use the 1996 Canadian Broadcasting Corporation's Massey lectures, which I have been invited to give, as a way of opening up the issues which I have been able to discuss briefly with you today for a broad audience. I'd welcome your energy as part of this effort.

One of my profound concerns for many years is that almost all of our research and action has gone to support the current structures of the economy and the society. The work you are currently doing shows that this situation is already shifting. It is my hope that you will leave this meeting even more committed to changing research and action patterns.

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The Role of Part-Time Work in Firm Adjustment: Evidence from Microdata on Employment Durations

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Are Part-time Jobs Secure Jobs? Empirical Estimates of Lay-off Hazards of Part-time and Full-time Workers

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and
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Section 1. Introduction

The Canadian labour market appears to be increasingly segmented into a primary sector with attractive compensation and relative job security and a secondary sector with unattractive compensation and relative job insecurity (Economic Council of Canada, 1990; 1991). One of the dimensions along which this growing segmentation can be observed is the increasing share of so-called non-standard work, including part-time work.

This paper investigates the relative stability of part-time and full-time employment in Canada. Using micro data on employment durations from the 1988-90 wave of the Labour Market Activity Survey, we are able to estimate the probability that employers lay off part-time and full-time workers. The issue of employment stability is an important one in two contexts. The first context is the question posed by a variety of authors and policy makers of whether or not part-time jobs are "bad" jobs from the point of view of workers (see, for example, Blank, 1990). Along with wages and benefits, job security is an important feature of job quality. Betcherman (1995) notes that addressing this question will enhance our ability to design social programs that adequately reflect the level of insecurity in this segment of the labour market. The second context is our understanding of the role of part-time employment in firms' dynamic adjustment strategies. Indeed, job insecurity from the perspective of workers is a form of flexibility from the perspective of employers. Labour market adjustment is an increasingly important issue in the current context of competitive pressures arising from globalization of product markets and rapid rates of technological innovation. Firms may be motivated to hire part-time workers partly because they can provide them with greater flexibility in adjusting their labour forces.

Adjusting part-time labour may be relatively inexpensive for a number of reasons, of which we note two in particular. First, workers who choose full-time employment may on average have stronger preferences for regular schedules and constant incomes than do workers who are employed on a part-time basis. Employment instability therefore may cause greater discontent among full-time workers than part-time workers, resulting in

reduced productivity or wage increases in a competitive model with compensating differentials. Blank's (1994) U.S. evidence that most women use part-time work as a temporary alternative to full-time work or being out of the labour force is consistent with this hypothesis.

A second reason why adjusting part-time labour may be relatively inexpensive is that firms may segment their labour forces into primary workers who have greater job security and secondary workers who act to absorb shocks to product demand. The idea that full-time workers may form "core" employment while part-time workers form "peripheral" employment has been suggested elsewhere (Betcherman, 1995). Rebitzer and Taylor (1991) provide a formal efficiency wage model in which a credible promise of future employment lowers the wage rate required to ensure that primary workers do not shirk. Part-time workers may form a natural source of secondary workers for firms pursuing this type of strategy.

There is little in the way of empirical evidence to corroborate these kinds of arguments about the nature of part-time job stability. Cross-sectional distributions of job tenure indicate that part-time employment spells do not, on average, last as long as full-time employment spells (Economic Council of Canada, 1990). Using micro data from the 1986-87 wave of the LMAS, Christofides and McKenna (1993, 1996) confirm this finding after controlling for a wide variety of covariates.

However, these studies do not distinguish between separations that are initiated by the employer and separations that are initiated by the worker. The social policy implications of the differences in job tenure distributions are obviously different if they merely reflect the higher quit propensities of part-time workers documented by Morisette, Picot and Pyper (1992) or if they are generated by different lay-off propensities. Since the LMAS data report reasons for separation, we are able to examine differences in the layoff probabilities of part-time and full-time workers.

Section 2. Data sources and variable definitions

All but one of the variables used to estimate the lay-off hazard model were constructed from the micro data contained in the Canadian Labour Market Activity Survey (LMAS) 1988-1990 Longitudinal File. The exception is data for the monthly provincial unemployment rate, which were obtained from CANSIM.

The sample used in this study is restricted to paid jobs in the non-farm sector that begin within the sample window, i.e. during or after January 1988. This selection rule avoids the potential problem of length-biased sampling. In addition, we exclude all jobs that report a start date in the first week of January 1990; as noted by Christofides and McKenna, a large number of spells appear to have their start dates miscoded as this week.

We are interested in the probability that an employment spell ends because of an employer-initiated lay-off, whether it be permanent or temporary. An employment spell is defined in the LMAS as having ended if the worker does not return to the same job within one year, i.e. temporary work interruptions are ignored when defining the duration of a job spell. This means, for example, that a job that involves a seasonal lay-off each year or a seasonal job to which the same worker returns in each year would be defined as a continuous job. We have broken up spells that report temporary interruptions due to seasonal or temporary layoffs into multiple spells. The rules for coding layoffs are provided in Appendix 1.

We conduct our analysis separately for four subsamples defined by part-time/full-time status and by gender. Part-time jobs are defined as those in which usual hours per week are less than thirty.

Section 3. Non-parametric estimates of the lay-off hazard

As described above, we are interested in investigating differences in the layoff hazard across these four subgroups. We begin by examining Kaplan-Meier estimates of the empirical hazard for each group. When generating these estimates, we treat as censored all spells that ended for reasons other than layoff, as well as those spells that are ongoing

at the end of the sample window. The number of censored and uncensored spells in each subsample is reported in Table 1.

Figures 1 and 2 present plots of the empirical hazard for women and men respectively. Both women's and men's part-time employment spells are *less* likely to end in a lay-off than their full-time counterparts up until about 30 weeks duration, after which the hazards become quite similar. These results indicate that part-time employment is *more* stable than full-time employment when stability is measured in terms of the lay-off hazard.

The first possibility that we investigate as an explanation for this somewhat surprising finding is the role of the unemployment insurance program. The Canadian UI system is widely believed to encourage the use of temporary lay-offs by firms and to lead to a disproportionate number of quits and lay-offs, particularly at the time that the Variable Entrance Requirement is met (Baker and Rea, 1993; Green and Riddell, 1993; Christofides and McKenna, 1995, 1996; Green and Sargent, 1995). Workers employed for fewer than 15 hours per week were not eligible for UI during the sample period.

In Figures 1 and 2 we see that the spikes in the hazard at 10 and 14 weeks now thought to be at least in part the result of behavioural responses to the UI program are less pronounced in the part-time samples, although the only one to disappear altogether is the 14-week spike in the male sub-sample. Plots of the empirical hazard for men and women who worked fewer than 15 hours per week and 15 to 29 hours per week are presented in Figures 3 and 4. The lay-off hazard in the sample of women who worked fewer than 15 hours per week, and who are therefore not covered by UI, has a puzzlingly large spike at 14 weeks. This evidence confirms the importance of using adequate identifying restrictions when estimating UI entrance requirement effects in data of this type.

The empirical hazards suggest a different relationship between the lay-off hazards of part-time and full-time workers than is suggested by the "shock absorber" hypothesis; part-time jobs appear to be more stable than full-time jobs. Of course, this difference may simply

reflect the different occupational and industrial distributions of part-time and full-time jobs. Previous researchers have focused largely on the total separation hazard, treating quits and layoffs as indistinguishable (Christofides and McKenna, 1995, 1996), or have treated quits and layoffs separately but included a smaller number of covariates and focused on looking at UI program parameters (see references above). In order to learn more about the part-time and full-time lay-off hazards, we now estimate a model that includes a wide variety of covariates for each of our four subsamples defined by gender and part-time and full-time status.

Section 4. Estimation with covariates

We investigate the effects of covariates on the lay-off hazard using a logit model of the lay-off probability. We include a number of different types of covariates. The first group consists of job characteristics, including industry, occupation, firm size, pension coverage, union status or coverage by a collective agreement, the hourly wage rate and usual weekly hours. The second group consists of worker characteristics. We include age and education variables to capture possible differences in human capital investments that might affect the lay-off probability. We also include a number of non-human capital related worker characteristics such as visible minority status, household type, foreign born status, and language. We include these variables in order to investigate the possibility that firms segment their labour force in a dynamic sense according to these characteristics, or that firms engage in more churning of workers with certain demographic features.

We include a number of variables that are functions of duration. We include duration, duration squared and the inverse of duration to provide a right-skewed functional form for the baseline hazard. We include dummy variables to capture possible spikes in the hazard between 10 and 15 weeks duration. We allow these spikes to differ in 1990 when the UI rules changed such that the Variable Entrance Requirement was the same in all jurisdictions.

In order to investigate the effect of UI eligibility on the part-time hazard we include a dummy variable indicating whether the worker was employed for fewer than 15 hours a

week. We interact this dummy variable with all of the continuous duration variables and with the spike dummies at 10 and 14 weeks. Monthly dummy variables are included to control for seasonal effects.

Selected variable means are presented in Table 2 for each of the four subsamples. Part-time women on average are more likely to be teen-aged, married, white and native-born than full-time women. They are less likely to be unionized or covered by a pension, and are disproportionately represented in smaller firms. The proportion of part-time men who are teen-aged is even greater than the proportion of part-time women. Part-time men are more likely than full-time men to be single, with or without children. Like women, they are much less likely to belong to unions and enjoy pension coverage and are overrepresented in small firms.

The industrial and occupational distributions of the four groups differ considerably. Both part-time women and men are relatively heavily concentrated in service and sales occupations and in the retail trade, education and accommodation and food service sectors. Part-time women are also concentrated in clerical occupations. Full-time women are heavily concentrated in clerical and service occupations in retail trade, health and welfare services and accommodation and food services. The most important occupational categories for full-time men are management, services and fabricating jobs.

Section 5. Results

Table 3 presents estimated derivatives of the hazard function evaluated at the sample mean for a selected group of covariates. The first four columns of Table 3 contain the estimated derivatives for females, part-time and full-time, and males, part-time and full-time. The next two columns compare the coefficients for full-time (part-time) women to the coefficients for full-time (part-time) men . The final two columns compare the coefficients for full-time women (men) to the coefficients for part-time women (men).

The first set of covariates are those associated with duration, which we have labeled "Hazard Function." The most interesting feature of this set of covariates is the evidence

from the last two columns that the "baseline" hazards of part-time and full-time workers differ significantly even after we have controlled for the full set of covariates. The nature of these differences are illustrated in Figures 5 and 6, which plot the simulated hazards for sales workers in retail trade who have modal characteristics for men and women respectively (see notes to Figure 5 and 6 for details). The simulated hazards of full-time men and women have remarkably similar shapes, increasing rapidly in the first few weeks of an employment spell and then gradually falling off over the first year. The part-time hazard for women has the same general shape, although the peak comes somewhat earlier. The clear outlier is the part-time hazard for men, which declines throughout the first year of the spell. However, note that we have relatively few uncensored observations for part-time men compared to the other demographic groups, so that the standard errors may be quite large.

Part-time sales workers in retail trade ~~face~~ with the chosen characteristics face much *lower* lay-off hazards than full-time workers, whether they are male or female. (Women face lower hazards then men in both cases.) This evidence is not consistent with the shock absorber hypothesis outlined earlier. The lower lay-off hazard rate for part-time workers in the Kaplan-Meier estimates does not appear to be simply a function of the different industrial and occupational distributions of part-time and full-time workers.

The derivatives in Table 3 tell us the proportional amount by which a characteristic shifts the simulated hazards plotted in Figures 5 and 6. Because the hazards plotted in Figures 5 and 6 are for our omitted industry group, we can look at lay-off hazards of part-time and full-time workers in other industry groups by shifting the simulated hazards in Figures 5 and 6 proportionately by the appropriate derivative for the chosen industry. To compare the hazard functions of other occupations we have to consider both the derivative for the sales occupation and the occupation of interest, since sales workers are not our base case. The last column in Table 3 tells us whether the relative stability of part-time jobs in other industries and occupations is greater or less than in our base case. As an illustration, Figures 7 and 8 display the simulated hazards for service occupations in the

Accommodation and Food Services industry. Once again, part-time jobs are more stable than full-time jobs. The difference between the two hazard rates is much more pronounced than in retail trade.

Compared to our base case, full-time service and fabricating jobs and jobs in the education and miscellaneous service sectors, held by women, are relatively less secure than their part-time counterparts. The opposite is true in transportation occupations and in the financial sector where part-time jobs are relatively unstable. Among jobs held by men, part-time management and teaching jobs and part-time jobs in forestry and logging and six other industries are less stable than corresponding full-time jobs. Part-time jobs are relatively stable in three occupations: forestry and logging, processing and material handling.

We now examine the effects of a variety of other covariates on the lay-off hazards of part-time and full-time workers. The dummies variables for weeks nine through fifteen, intended to pick up any effects associated with the Variable Entrance Requirement of the UI program, reveal statistically significant spikes at 10 and 14 weeks in all four subsamples, some of which may in fact be the result of the program. These dummy variables are not identifying the UI effects as cleanly as is done in studies that focus explicitly on this question because we have geographical coding by province rather than by UI region. When we interact the dummies for 10 and 14 weeks with the dummy variable indicating UI eligibility (working less than 15 hours per week) in the part-time samples, the only statistically significant difference in the spikes is at 14 weeks in the female sample. This difference is the opposite of what one would expect: part-time women who are not eligible for UI have a larger spike at 14 weeks than those that are eligible for UI. This finding highlights the importance of identifying restrictions when estimating the effect of the VER on employment durations, as emphasized by Green and Riddell (1993). The continuous portion of the baseline hazard is also not statistically significantly different for

the part-time workers who are and are not eligible for UI. This finding is perhaps "good news" in light of the recent changes to the UI Act extending coverage to these workers.[1]

The provincial unemployment rate was included as a monthly time-varying covariate. Lay-offs of full-time men and full-time women are countercyclical, although the coefficient is statistically significant only in the male sample. Lay-offs of part-time men and part-time women are *procyclical,* and the coefficient is statistically significant in both samples. During periods of high unemployment, firms appear to be more likely to lay off full-time workers and less likely to lay off part-time workers. This result provides another piece of evidence suggesting that part-time workers do not act as "shock absorbers" in the dimension of employment variation.

The next two panels of Table 3 present the effects on the lay-off hazards of a number of individual characteristics. The first set of variables describe household type. Women with children and men who are single parents face significantly higher lay-off hazards in full-time jobs than do full-time workers who live in other types of households. Part-time women with children are equally likely to be laid-off as part-time women in other types of households. One possible interpretation of this finding is that workers who are primary caregivers are churned in full-time jobs to a greater extent than other workers, reflecting a more complex matching process. Men employed in part-time jobs who have children are less likely to be laid-off than men employed in part-time jobs who do not have children. This result is more difficult to interpret.

The next set of estimates in Table 3 indicates that the only statistically significant effect of visible minority status of country of origin is in the case of full-time men. Visible minority immigrant men in full-time jobs face a lower lay-off hazard than other men.

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[1] In order to investigate this issue more fully we would need the appropriate geographical coding and would want to consider the quit hazard as well as the lay-off hazard.

comparable to Friesen's for a large number of reasons, the higher quit rate of part-time workers provides a possible means of reconciling the finding of more rapid net employment adjustment with lower lay-off hazards for part-time workers. Gross and Friesen (1996) find that the part-time quit rate is ~~counter~~procyclical, so the behaviour of quits cannot explain our finding of the procyclical nature of the part-time lay-off hazard.

Under the assumption that churning and attrition do not explain all of the observed difference, we are left with the apparent puzzle that firms vary part-time employment less than full-time employment. Our evidence suggests that differences in unemployment insurance eligibility do not explain this difference. Another possibility is that firms adjust part-time labour in the hours dimension rather than in the employment dimension. Overtime laws, for example, might make part-time hours relatively flexible compared to full-time hours, leading firms to substitute this form of adjustment for other more costly forms of adjustment. Part-time hours flexibility might also contribute to full-time employment security by providing firms with an alternative to changing full-time employment or hours. Unfortunately we cannot investigate this possibility with these data. At a time when there is widespread concern about employment security and labour market flexibility, future research should be aimed at investigating these more complex dynamic interrelationships.

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Table 1. Total and uncensored spells

	# of spells	# uncensored
Part-time female	7,652	1,678
< 15 hours	2,875	596
15-29 hours	4,777	1,082
Full-time female	13,763	4,194
Part-time male	3,349	890
< 15 hours	1,339	332
15-29 hours	2,010	558
Full-time male	15,594	5,838

Table 2: Selected Data Means, for Full Time and Part Time Females and Males

		Females		Males	
Type of Variable	**Variable Label**	**Full Time**	**Part Time**	**Full Time**	**Part Time**
Number of Cases		590960	321684	642538	122058
Number of Layoffs (Dependent Variable)		4188	1625	5761	862
Household Type	**Single Adult**	0.163	0.113	0.183	0.176
	Married Adult	0.215	0.146	0.201	0.145
	Married Adult with Child(ren)	0.534	0.652	0.576	0.601
	Single Adult with Child(ren)	0.089	0.088	0.041	0.078
Employment Equity Group	**Canadian born White**	0.850	0.866	0.853	0.845
	Visible Minority	0.036	0.033	0.037	0.048
	Immigrant	0.085	0.080	0.083	0.029
	Visible Minority Immigrant	0.029	0.020	0.027	0.078
Wage	Hourly Wage	$9.59	$8.99	$12.35	$9.53
Labour Power	Union	0.261	0.202	0.294	0.192
	Collective Bargain (No Union)	0.050	0.051	0.043	0.054
	Pension Coverage	0.324	0.137	0.379	0.101
	Federally Regulated Sector	0.106	0.065	0.135	0.115
UI Coverage	Uncovered Part Time Worker		0.386		0.428
Firm Size	**19 or Fewer Employees**	0.441	0.511	0.409	0.469
	20 to 99 Employees	0.160	0.148	0.173	0.156
	100 to 499 Employees	0.109	0.098	0.121	0.091
	500 or More Employees	0.290	0.243	0.297	0.284
Weekly Hours	Hours	39.92	16.01	44.35	15.16
Occupation	**Clerical**	0.378	0.369	0.113	0.098
	Managers	0.107	0.027	0.112	0.045
	Teaching	0.054	0.088	0.024	0.071
	Sales	0.085	0.156	0.079	0.140
	Services	0.188	0.277	0.102	0.269
	Forestry and Logging	0.003		0.031	0.003
	Processing	0.047	0.017	0.087	0.033
	Metalwork	0.003		0.032	
	Fabricating	0.032	0.012	0.127	0.043
	Transportation	0.007	0.014	0.082	0.086
	Material Handling	0.014	0.011	0.044	0.087
Industry	Forestry and Logging	0.006	0.002	0.035	0.004
	Metal Mines	0.001		0.016	0.001
	Non-Metal Mines	0.000		0.003	0.003
	Food and Beverage	0.050	0.019	0.050	0.028
	Textile and Knitting Mills	0.006	0.001	0.003	
	Wood Industries	0.004	0.002	0.034	0.008
	Furniture and Fixtures	0.002	0.002	0.004	
	Electrical Products	0.007	0.001	0.010	
	Petroleum and Coal Products	0.000		0.005	
	Chemical and Chemical Products	0.006	0.002	0.008	0.001
	Miscellaneous Manufacturing	0.004	0.001	0.006	0.002
	General Contractors	0.016	0.015	0.077	
	Communication	0.018	0.012	0.022	0.026
	Electrical Power, Gas and Water Utilities	0.007	0.002	0.018	0.002
	Retail Trade	0.178	0.249	0.157	0.296
	Finance Industries	0.042	0.027	0.011	0.009
	Education and Related Services	0.083	0.133	0.040	0.105
	Accomodation and Food Services	0.109	0.150	0.047	0.148
	Miscellaneous Services	0.025	0.036	0.025	0.036

Note: **Bold** denotes left out category of dummy variable.

Table 3: Logistic Regression: Selected Results

		Females		Males		Female/Male Diff		Full/Part Time Diff	
		Full Time	Part Time	Full Time	Part Time	Full Time	Part Time	Females	Males
Type of Variable	Variable Label	dP/dX	dP/dX	dP/dX	dP/dX	dP/dX	dP/dX	dP/dX	dP/dX
Hazard Function	Intercept	-0.0179 *	-0.0156 *	-0.0232 *	-0.0201 *	0.0053 *	0.0045 **	-0.0023 ***	-0.0031
	Time	-0.0001 *	-0.0001 *	-0.0002 *	-0.0001 *	0.0000 *	0.0000	0.0000	0.0000 ***
	Time Squared	0.0000 *	0.0000 *	0.0000 *	0.0000 *	0.0000 **	0.0000	0.0000	0.0000
	Time Inverse	-0.0023 *	-0.0005	-0.0017 *	0.0007	-0.0006	-0.0012	-0.0018 **	-0.0024 ***
	Week 9	0.0009 *	0.0008 ***	0.0014 *	0.0007	-0.0005	0.0001	0.0001	0.0008
	Week 10	0.0025 *	0.0010 ***	0.0031 *	0.0036 *	-0.0007	-0.0026 **	0.0014 **	-0.0005
	Week 11	0.0007 ***	0.0004	-0.0003	-0.0024 ***	0.0009 ***	0.0028 **	0.0003	0.0021
	Week 12	0.0006 ***	-0.0003	0.0013 *	0.0003	-0.0007	-0.0005	0.0009	0.0011
	Week 13	-0.0005	-0.0006	-0.0010 **	0.0008	0.0005	-0.0014	0.0001	-0.0018 ***
	Week 14	0.0017 *	0.0012 ***	0.0027 *	0.0022 ***	-0.0010	-0.0010	0.0005	0.0004
	Week 15	-0.0002	0.0004	-0.0008	-0.0005	0.0006	0.0008	-0.0005	-0.0003
	Week 10 in 1990	-0.0003		-0.0013 ***		0.0010		-0.0003	
	Week 14 in 1990	0.0003	-0.0003	0.0014 **	-0.0009	-0.0011	0.0006	0.0007	0.0023
	Provincial Unemployment Rate	0.0001	-0.0002 **	0.0002 *	-0.0003 **	-0.0001 ***	0.0002	0.0002 **	0.0005 *
Household Type	**Single Adult**								
	Married Adult	0.0000	-0.0003	-0.0002	0.0003	0.0002	-0.0007	0.0003	-0.0005
	Married Adult with Child(ren)	0.0006 *	-0.0002	0.0000	0.0016 *	0.0006 **	-0.0018 *	0.0007 **	-0.0017 *
	Single Adult with Child(ren)	0.0005 ***	0.0004	0.0006 ***	0.0025 *	-0.0001	-0.0021 *	0.0001	-0.0020 **
Employment Equity Group	**White Canadian Born**								
	Visible Minority	0.0002	-0.0003	0.0002	-0.0007	0.0000	0.0004	0.0005	0.0009
	Immigrant	-0.0004	-0.0003	0.0001	-0.0006	-0.0005	0.0003	-0.0001	0.0007
	Visible Minority Immigrant	-0.0001	0.0007	-0.0024 **	0.0002	0.0023 ***	0.0005	-0.0008	-0.0026 **
Wage	Hourly Wage	-0.0002 *	0.0000	-0.0001 *	0.0000 ***	-0.0001 **	0.0000	-0.0002 *	-0.0001 **
Labour Power	Union	-0.0005 *	-0.0009 *	0.0002	-0.0013 **	-0.0007 **	0.0004	0.0004	0.0015 **
	Collective Bargain (No Union)	0.0006 **	-0.0005	0.0012 *	0.0014 **	-0.0006	-0.0019 **	0.0011 **	-0.0002
	Pension Coverage	-0.0030 *	-0.0017 *	-0.0030 *	-0.0009	0.0001	-0.0008	-0.0012 *	-0.0021 *
	Federally Regulated Sector	0.0031 *	0.0042 *	0.0020 *	0.0003	0.0010	0.0039 **	-0.0011	0.0017
UI Coverage	Uncovered Part Time Worker	N/A	-0.0004	N/A	0.0004	N/A	-0.0008	N/A	N/A
Firm Size	**19 or Fewer Employees**								
	20 to 99 Employees	-0.0004 **	-0.0006 **	-0.0006 *	-0.0005	0.0002	0.0000	0.0002	-0.0001
	100 to 499 Employees	0.0001	-0.0001	0.0001	-0.0005	0.0000	0.0004	0.0002	0.0006
	500 or More Employees	0.0001	-0.0003	-0.0009 *	-0.0020 *	0.0009 *	0.0016 *	0.0004	0.0011 **
Weekly Hours	Hours	0.0000 *	0.0001 *	0.0000 *	0.0001 ***	0.0000	0.0000	0.0000	0.0000

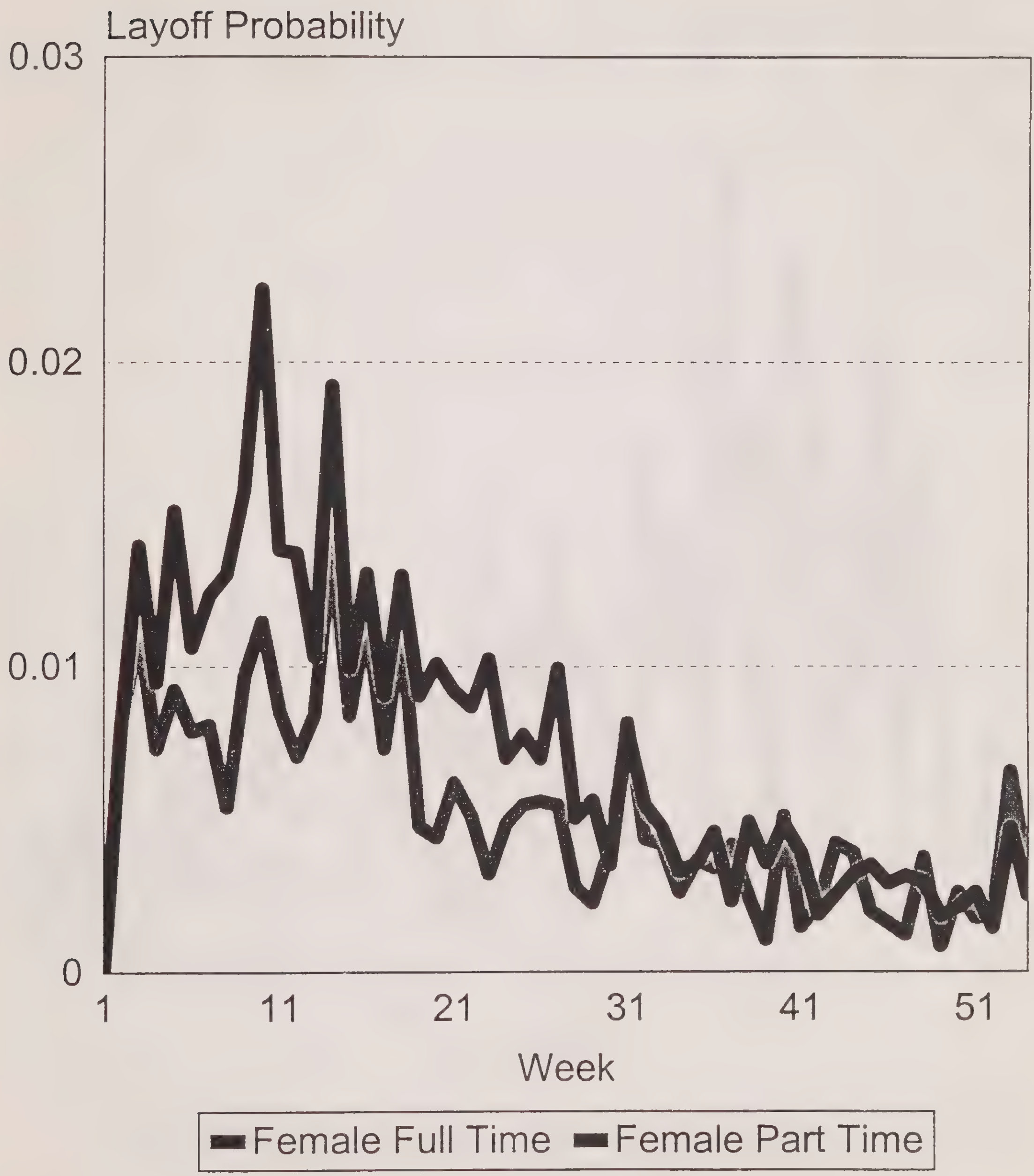
Table 3

		Females		Males		Female/Male Diff		Full/Part Time Diff	
Type of Variable	Variable Label	Full Time dP/dX	Part Time dP/dX	Full Time dP/dX	Part Time dP/dX	Full Time dP/dX	Part Time dP/dX	Females dP/dX	Males dP/dX
Occupation (Selected)	Managers	-0.0007 **	0.0002	-0.0039 *	-0.0023 ***	0.0032 *	0.0025 ***	-0.0009	-0.0016
	Teaching	0.0000	0.0007 ***	-0.0014	0.0020 ***	0.0015	-0.0014	-0.0006	-0.0034 **
	Sales	0.0001	0.0002	-0.0011 **	-0.0015 ***	0.0013 **	0.0017 ***	-0.0001	0.0004
	Services	0.0005 **	-0.0001	0.0009 **	-0.0015 ***	-0.0005	0.0013	0.0006	0.0024 **
	Forestry and Logging	0.0039 *		0.0037 *	-0.0007	0.0002			0.0044 ***
	Processing	0.0012 *	0.0016 **	0.0018 *	0.0004	-0.0006	0.0012	-0.0004	0.0014
	Fabricating	0.0020 *	0.0006	0.0007 ***	0.0000	0.0013 **	0.0006	0.0014	0.0007
	Transportation	-0.0001	0.0023 *	0.0009 **	0.0010	-0.0010	0.0013	-0.0024 *	-0.0001
	Material Handling	0.0013 *	0.0006	0.0023 *	-0.0009	-0.0009	0.0015	0.0007	0.0031 *
Industry (Selected)	Forestry and Logging	0.0036 *	0.0064 *	0.0034 *	0.0091 *	0.0003	-0.0027	-0.0028 ***	-0.0058 *
	Metal Mines	0.0038 ***		-0.0006	0.0078 **	0.0044 **			-0.0084 **
	Non-Metal Mines	0.0118 *		0.0041 *	0.0035	0.0077 *			0.0006
	Food and Beverage	0.0035 *	0.0036 *	0.0027 *	0.0048 *	0.0008	-0.0013	-0.0001	-0.0021 ***
	Textile and Knitting Mills	0.0019 **	0.0038 **	0.0017		0.0002	0.0038 **	-0.0019	
	Wood Industries	0.0037 *	0.0035 **	0.0021 *	0.0034 ***	0.0015 ***	0.0000	0.0002	-0.0013
	Furniture and Fixtures	0.0025 **	0.0037 **	0.0033 *		-0.0008	0.0037 **	-0.0012	
	Electrical Products	0.0018 **	0.0040 **	0.0014		0.0004	0.0040 **	-0.0022	
	Petroleum and Coal Products	0.0071 *		0.0028 *		0.0043 **			
	Chemical and Chemical Products	-0.0020	0.0003	0.0010	0.0078 *	-0.0030	-0.0075 **	-0.0023	-0.0068 **
	Miscellaneous Manufacturing	0.0009	0.0033	0.0000	0.0050 ***	0.0009	-0.0017	-0.0024	-0.0050 ***
	General Contractors	-0.0001	-0.0016 ***	-0.0009		0.0008	-0.0016 ***	0.0015	-0.0009
	Communication	-0.0017 **	-0.0015	-0.0047 *	0.0007	0.0030 **	-0.0022	-0.0003	-0.0054 *
	Electrical Power, Gas and Water	0.0025 *	0.0028	0.0006	0.0052 **	0.0019 ***	-0.0024	-0.0003	-0.0046 ***
	Finance Industries	-0.0063 *	-0.0046 *	-0.0047 *	-0.0075	-0.0016	0.0029	-0.0017	0.0028
	Education and Related Services	0.0036 *	0.0034 *	0.0015 **	0.0030 *	0.0022 *	0.0004	0.0002	-0.0015
	Accomodation and Food Services	0.0009 *	0.0013 *	0.0006	-0.0008	0.0003	0.0021 **	-0.0004	0.0014
	Miscellaneous Services	0.0023 *	0.0003	0.0014 *	0.0014	0.0009	-0.0011	0.0020 *	0.0000

Notes: **Bold** denotes the omitted dummy variable in a grouping. * denotes significance at the 1% level;
** denotes significance at the 5% level; *** denotes significance at the 10% level
dP/dX is the derivative of the layoff probability with respect to a change in the independent variable(s).
It is evaluated at the sample mean for each group, and calculated as dP/dX = BP*(1-P*),
where B is the estimated logit coefficient and P* is the mean of the dependent variable (layoff).
Significance for dP/dX is calculated treating P* as nonstochastic, so that SE(dP/dX) = P*SE(B).

Figure 1: Kaplan-Meier Estimates of Layoff Hazards

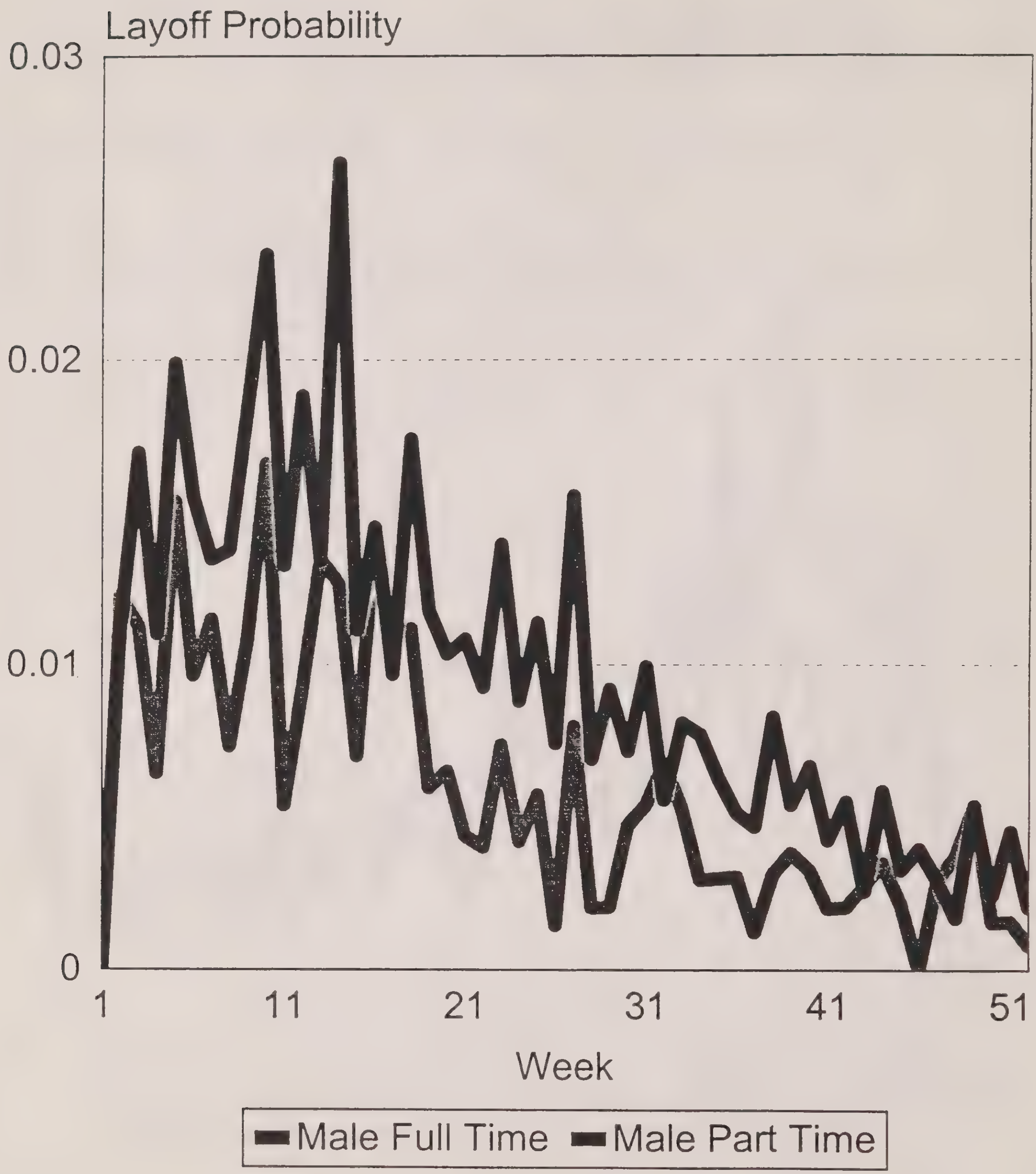
Females, Full Time and Part Time



Labour Market Activity Survey

Figure 2: Kaplan-Meier Estimates of Layoff Hazards

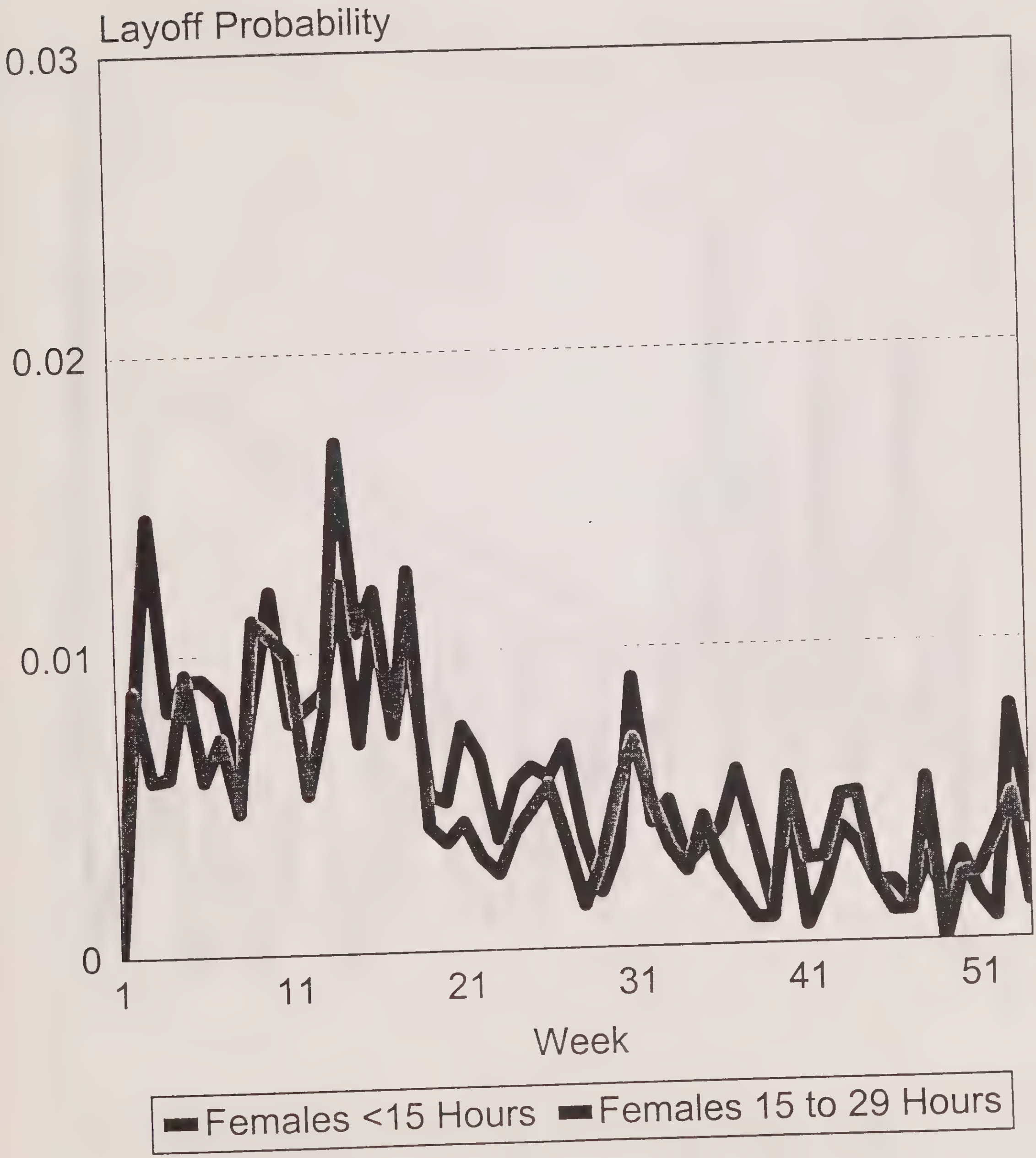
Males, Full Time and Part Time



Labour Market Activity Survey

Figure 3: Kaplan-Meier Estimates of Layoff Hazards

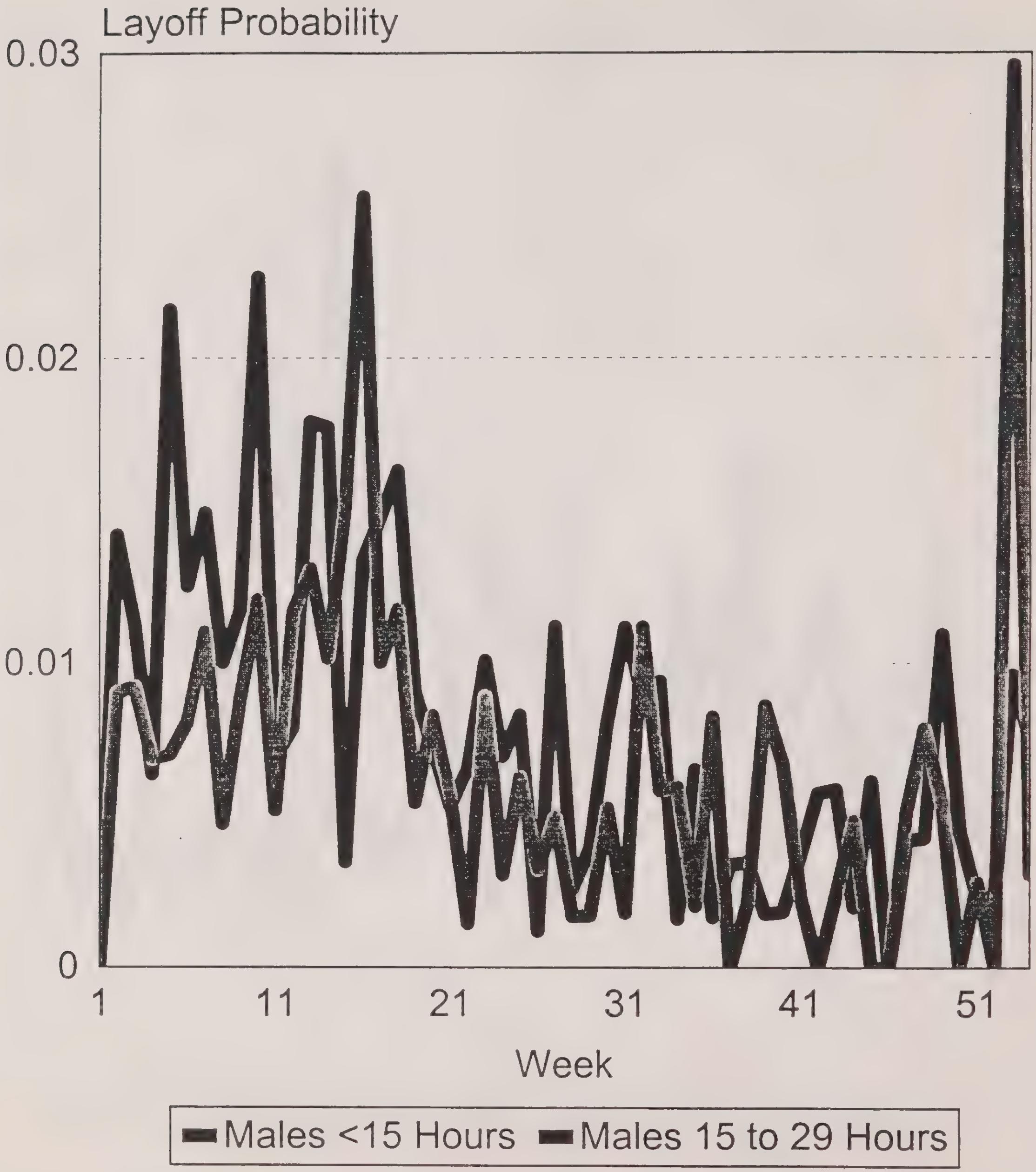
Part Time Females, by Hours per Week



Labour Market Activity Survey

Figure 4: Kaplan-Meier Estimates of Layoff Hazards

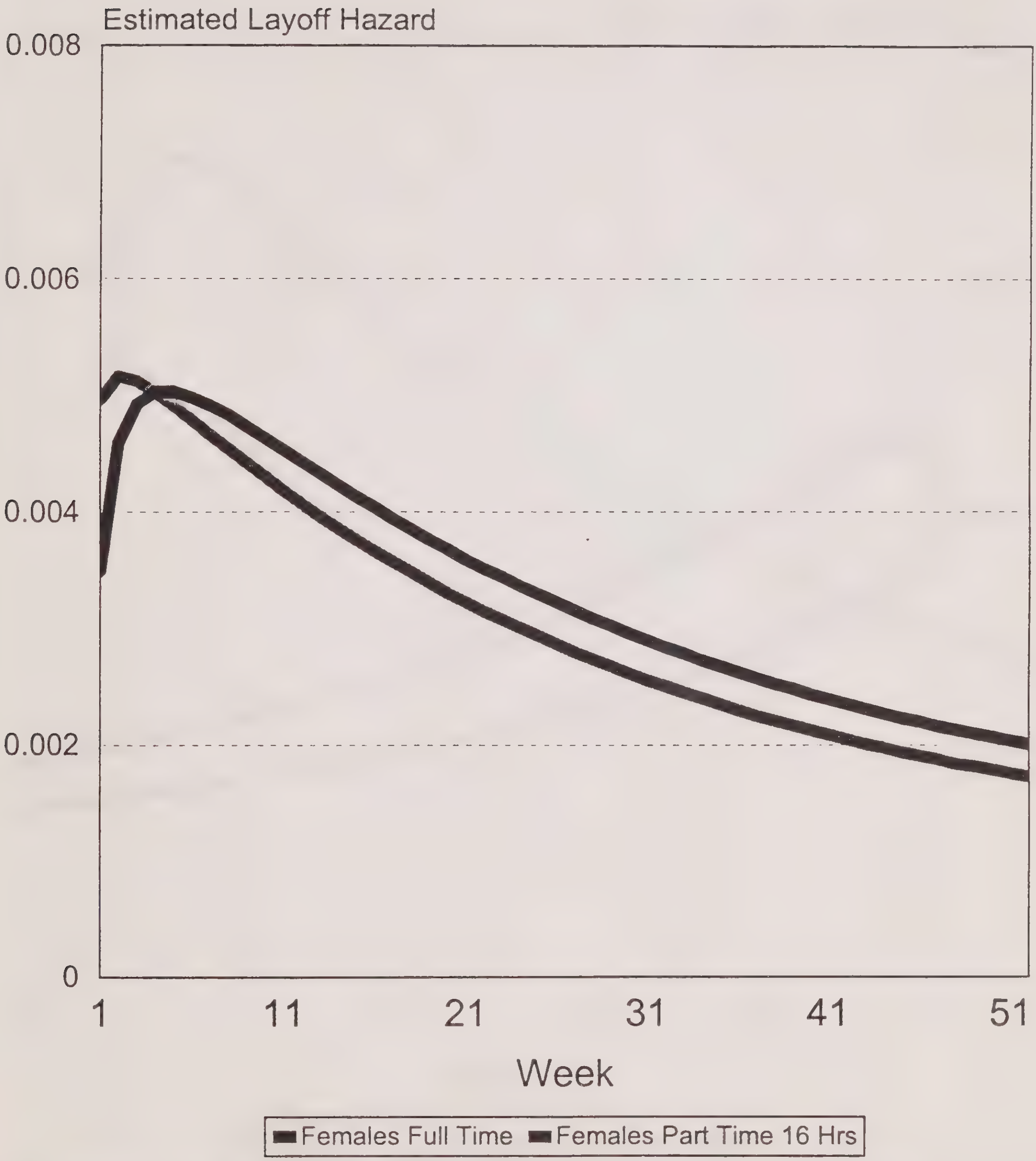
Part Time Males, by Hours per Week



Labour Market Activity Survey

Figure 5: Simulated Hazards

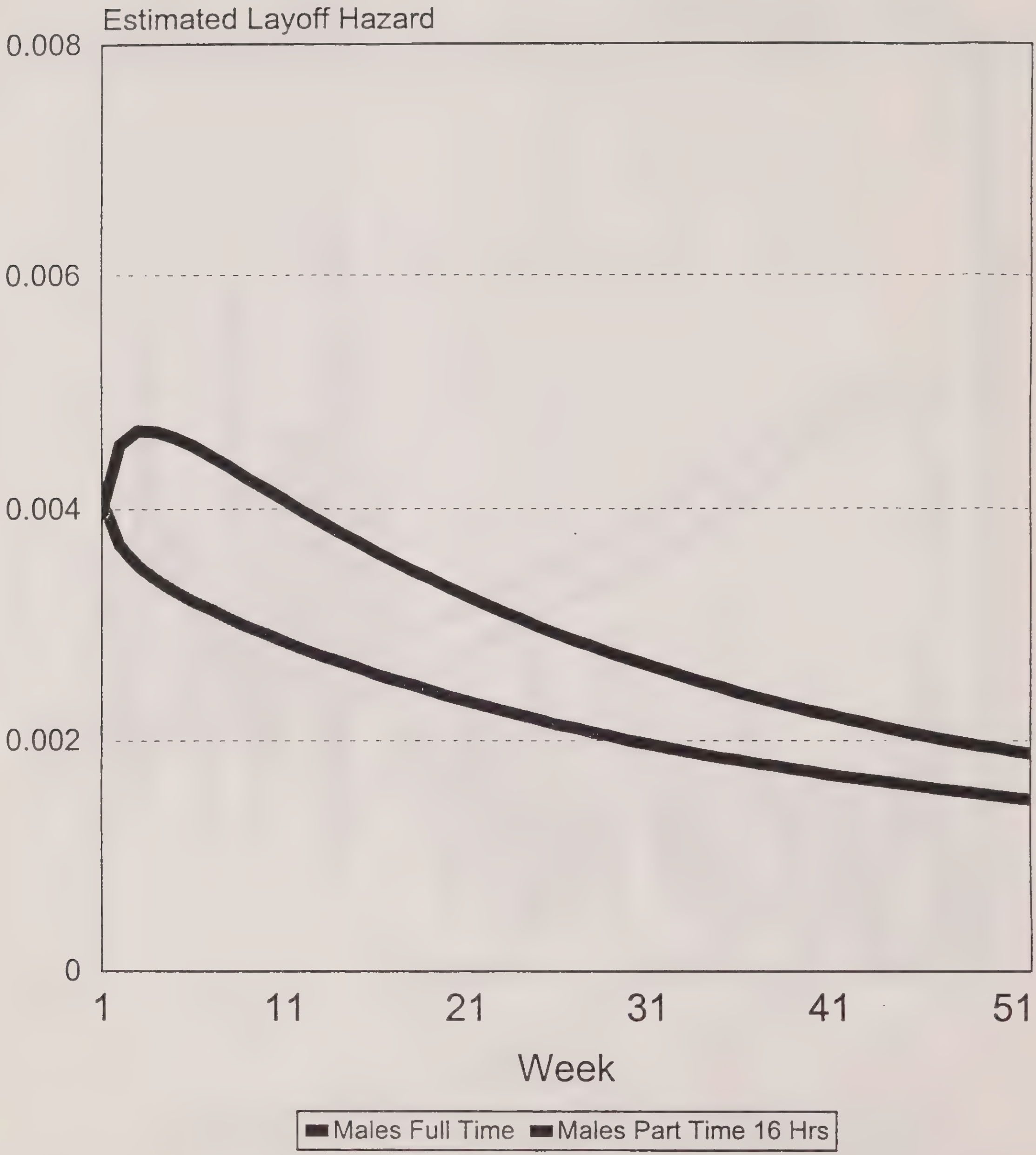
Females, Full Time and Part Time, Retail Sales



UI Covered, UR=9, June, 25-34 Years old, Married w/Children, Canadian born White, Some Post Secondary, Ontario, Nonunion, No Pension, No Collective Bargain, Not Federally Regulated, 19 or Fewer Employees, 9$/hr, 40 hrs Full, 16 Hrs Part, Salesl, Retail.

Figure 6: Simulated Hazards

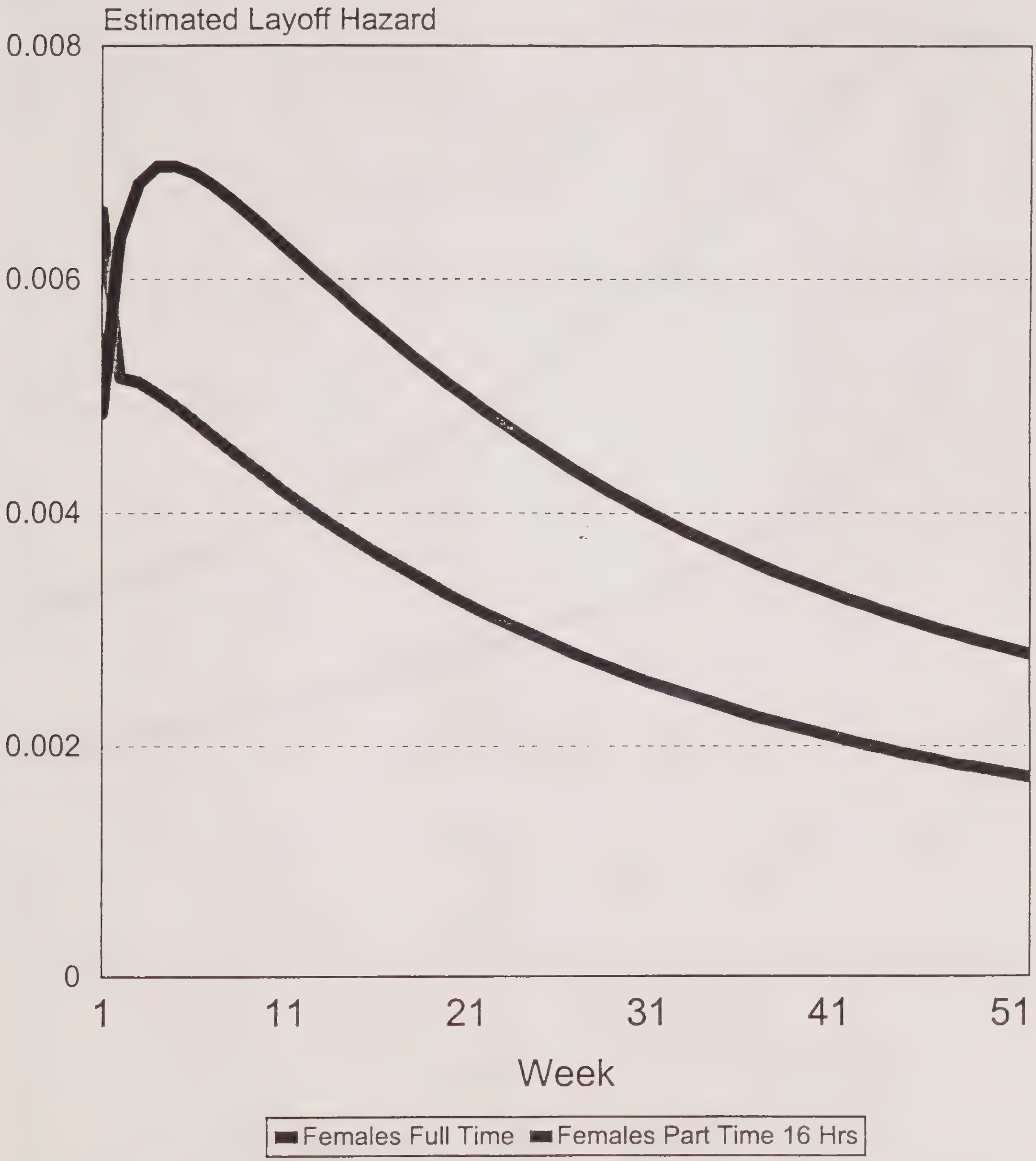
Males, Full Time and Part Time, Retail Sales



UI Covered, UR=9, June, 25-34 Years old, Married w/Children, Canadian born White, Some Post Secondary, Ontario, Nonunion, No Pension, No Collective Bargain, Not Federally Regulated, 19 or Fewer Employees, 9$/hr, 40 hrs Full, 16 Hrs Part, Sales, Retail.

Figure 7: Simulated Hazards

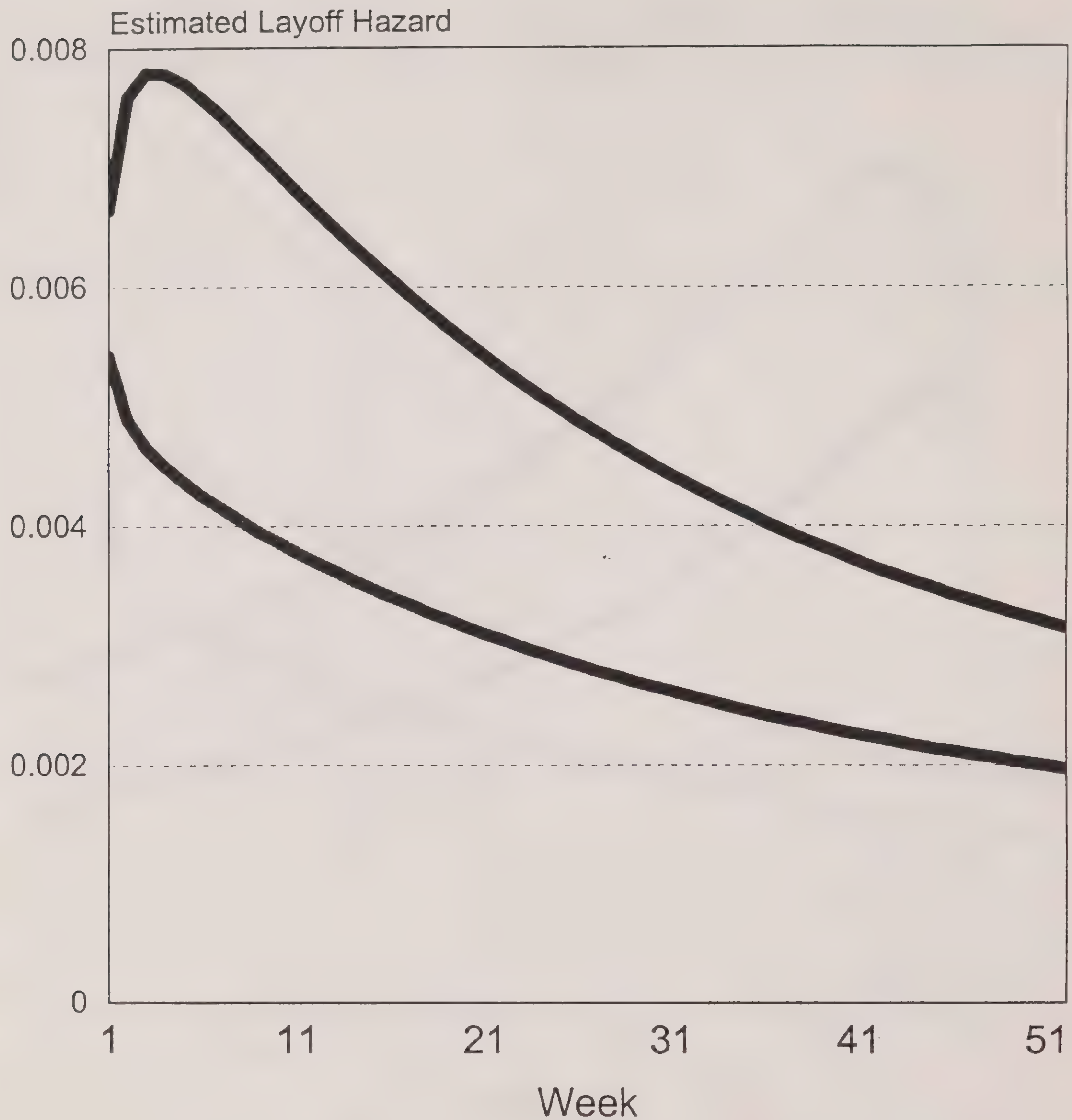
Females, Full Time and Part Time, Accomodation Services



UI Covered, UR=9, June, 25-34 Years old, Married w/Children, Canadian born White, Some Post Secondary, Ontario, Nonunion, No Pension, No Collective Bargain, Not Federally Regulated, 19 or Fewer Employees, 9$/hr, 40 hrs Full, 16 Hrs Part, Services, Accomodation

Figure 8: Simulated Hazards

Males, Full Time and Part Time, Accomodation Services



UI Covered, UR=9, June, 25-34 Years old, Married w/Children, Canadian born White, Some Post Secondary, Ontario, Nonunion, No Pension, No Collective Bargain, Not Federally Regulated, 19 or Fewer Employees, 9$/hr, 40 hrs Full, 16 Hrs Part, Services, Accomodation.

Appendix 1. Definition of a lay-off.

A permanent separation is coded as a lay-off if the reason for the job ending is given as:

D seasonal nature of job
E end of temporary non-seasonal job
F non-seasonal economic or business conditions
K an on-call arrangement
M dismissal by the employer
O company moving or going out of business.

A temporary separation is coded as a lay-off if the reason for the job ending is given as:

F seasonal layoff
G temporary non-seasonal layoff.

Appendix Table 1: Data Means, for Full Time and Part Time Females and Males

		Females		Males	
Type of Variable	**Variable Label**	**Full Time**	**Part Time**	**Full Time**	**Part Time**
Number of Cases		590960	321684	642538	122058
Number of Layoffs (Dependent Variable)		4188	1625	5761	862
Hazard Function	Intercept	1.000	1.000	1.000	1.000
	Time	43	42	43	38
	Time Squared	3254	3011	3228	2580
	Time Inverse	0.088	0.090	0.090	0.099
	Week 9	0.019	0.020	0.020	0.022
	Week 10	0.019	0.019	0.019	0.021
	Week 11	0.018	0.018	0.018	0.020
	Week 12	0.017	0.018	0.018	0.020
	Week 13	0.017	0.018	0.017	0.019
	Week 14	0.016	0.017	0.017	0.019
	Week 15	0.016	0.016	0.016	0.018
	Week 10 in 1990	0.006	0.006	0.006	0.006
	Week 14 in 1990	0.005	0.006	0.005	0.006
	Not Covered by UI		0.386		0.428
	Not Covered by UI * Week 10		0.007		0.009
	Not Covered by UI * Week 14		0.007		0.008
	Not Covered by UI * Time		16		16
	Not Covered by UI * Time Squared		1146		1083
	Not Covered by UI * Time Inverse		0.034		0.041
	Provincial Unemployment Rate	9.57	8.74	9.59	8.93
Month	January	0.048	0.051	0.047	0.052
	February	0.052	0.055	0.051	0.057
	March	0.069	0.073	0.067	0.074
	April	0.059	0.061	0.058	0.062
	May	0.065	0.064	0.066	0.064
	June	0.092	0.085	0.094	0.085
	July	0.081	0.070	0.084	0.072
	August	0.082	0.072	0.086	0.074
	September	0.098	0.094	0.101	0.094
	October	0.078	0.081	0.079	0.080
	November	0.083	0.090	0.083	0.089
	December	0.193	0.205	0.185	0.196
Age	**16 Years old in 1988**	0.019	0.076	0.019	0.156
	17 to 19 Years old in 1988	0.109	0.149	0.106	0.293
	20 to 24 Years old in 1988	0.202	0.137	0.199	0.175
	25 to 34 Years old in 1988	0.338	0.276	0.353	0.165
	35 to 44 Years old in 1988	0.213	0.229	0.192	0.103
	45 to 54 Years old in 1988	0.095	0.098	0.091	0.060
	55 to 64 Years old in 1988	0.023	0.034	0.040	0.049
Household Type	**Single Adult**	0.163	0.113	0.183	0.176
	Married Adult	0.215	0.146	0.201	0.145
	Married Adult with Child(ren)	0.534	0.652	0.576	0.601
	Single Adult with Child(ren)	0.089	0.088	0.041	0.078
Employment Equity Group	**Canadian born White**	0.850	0.866	0.853	0.845
	Visible Minority	0.036	0.033	0.037	0.048
	Immigrant	0.085	0.080	0.083	0.029
	Visible Minority Immigrant	0.029	0.020	0.027	0.078

Appendix Table 1

Type of Variable	Variable Label	Females Full Time	Females Part Time	Males Full Time	Males Part Time
Education	**Less than High School**	0.231	0.195	0.283	0.191
	High School	0.164	0.200	0.214	0.270
	Some Post-Secondary	0.257	0.248	0.223	0.201
	Post-Secondary Certificate	0.144	0.176	0.133	0.221
	University Degree	0.204	0.181	0.147	0.118
Language	Non French Speaker in Quebec	0.133	0.128	0.136	0.131
	Non English Speaker outside Quebec	0.063	0.047	0.064	0.044
Province	British Columbia	0.103	0.126	0.114	0.131
	Alberta	0.146	0.152	0.155	0.120
	Saskatchewan	0.072	0.113	0.072	0.092
	Manitoba	0.065	0.077	0.061	0.080
	Ontario	0.179	0.182	0.151	0.201
	Quebec	0.152	0.144	0.156	0.148
	Nova Scotia	0.071	0.067	0.075	0.064
	Prince Edward Island	0.034	0.019	0.030	0.026
	New Brunswick	0.085	0.069	0.098	0.085
	Newfoundland	0.092	0.051	0.088	0.055
Wage	Hourly Wage	$9.59	$8.99	$12.35	$9.53
Labour Power	Union	0.261	0.202	0.294	0.192
	Collective Bargain (No Union)	0.050	0.051	0.043	0.054
	Pension Coverage	0.324	0.137	0.379	0.101
	Government Sector	0.106	0.065	0.135	0.115
Firm Size	**19 or Fewer Employees**	0.441	0.511	0.409	0.469
	20 to 99 Employees	0.160	0.148	0.173	0.156
	100 to 499 Employees	0.109	0.098	0.121	0.091
	500 or More Employees	0.290	0.243	0.297	0.284
Weekly Hours	Hours	39.92	16.01	44.35	15.16
Occupation	**Clerical**	0.307	0.260	0.041	0.098
	Managers	0.107	0.027	0.112	0.045
	Science, Math and Architecture	0.019	0.003	0.060	0.012
	Social Science	0.030	0.023	0.013	0.021
	Religion	0.001		0.003	
	Teaching	0.054	0.088	0.024	0.071
	Medical	0.066	0.085	0.011	0.017
	Arts and Recreation	0.014	0.021	0.018	0.042
	Sales	0.085	0.156	0.079	0.140
	Services	0.188	0.277	0.102	0.269
	Agriculture	0.005		0.013	0.010
	Fishing, Hunting and Trapping	0.008		0.023	0.004
	Forestry and Logging	0.003		0.031	0.003
	Mining	0.000		0.022	0.005
	Processing	0.047	0.017	0.087	0.033
	Metalwork	0.003		0.032	
	Fabricating	0.032	0.012	0.127	0.043
	Construction	0.003		0.057	0.009
	Transportation	0.007	0.014	0.082	0.086
	Material Handling	0.014	0.011	0.044	0.087
	Other Operators	0.007	0.007	0.018	0.005

Appendix Table 1

Type of Variable	Variable Label	Females		Males	
		Full Time	Part Time	Full Time	Part Time
Industry	Forestry and Logging	0.006	0.002	0.035	0.004
	Fishing, Hunting and Trapping	0.009	0.002	0.023	0.005
	Metal Mines	0.001		0.016	0.001
	Mineral Fuels	0.004		0.016	0.003
	Non-Metal Mines	0.000		0.003	0.003
	Quarries and Sand Pits	0.000		0.002	
	Services Incidental to Mining	0.001		0.013	
	Food and Beverage	0.050	0.019	0.050	0.028
	Tobacco Products	0.000			
	Rubber and Plastic Products	0.004	0.001	0.011	0.002
	Leather Products	0.002		0.000	
	Textile and Knitting Mills	0.006	0.001	0.003	
	Clothing	0.011	0.004	0.002	
	Wood Industries	0.004	0.002	0.034	0.008
	Furniture and Fixtures	0.002	0.002	0.004	
	Paper and Allied Industries	0.003		0.020	0.004
	Printing-Publishing and Allied	0.013	0.011	0.010	
	Primary Metal	0.003	0.000	0.012	
	Metal Fabricating	0.004	0.002	0.015	0.005
	Machinery Industries	0.003		0.012	0.001
	Transportation Equipment	0.008	0.002	0.028	
	Electrical Products	0.007	0.001	0.010	
	Non-Metallic Mineral Products	0.002	0.002	0.011	0.003
	Petroleum and Coal Products	0.000		0.005	
	Chemical and Chemical Products	0.006	0.002	0.008	0.001
	Miscellaneous Manufacturing	0.004	0.001	0.006	0.002
	General Contractors	0.016	0.015	0.077	
	Storage	0.001		0.002	0.001
	Communication	0.018	0.012	0.022	0.026
	Electrical Power, Gas and Water Utilities	0.007	0.002	0.018	0.002
	Wholesale Trade	0.026	0.021	0.073	0.036
	Retail Trade	0.178	0.249	0.157	0.296
	Finance Industries	0.042	0.027	0.011	0.009
	Insurance Carriers	0.014	0.003	0.008	
	Insurance Agencies and Real Estate	0.020	0.010	0.013	0.023
	Education and Related Services	0.083	0.133	0.040	0.105
	Health and Welfare Services	0.139	0.171	0.028	0.057
	Religious Organisations	0.005	0.008	0.004	0.008
	Amusement and Recreational Services	0.017	0.022	0.016	0.049
	Services to Business Management	0.056	0.029	0.048	0.034
	Personal Services	0.032	0.032	0.007	0.008
	Accomodation and Food Services	0.109	0.150	0.047	0.148
	Miscellaneous Services	0.025	0.036	0.025	0.036
	Federal Administration				0.054
	Provincial Administration	0.036	0.010	0.025	0.009
	Local Administration	0.020	0.017	0.030	0.029

Notes **Bold** denotes dropped category of dummy variable.

Appendix Table 2: Logistic Regression Results

		Females				Males			
		Full Time		Part Time		Full Time		Part Time	
Type of Variable	Variable Label	Beta	Std Err	Beta	Std Err	Beta	Std Err	Beta	Std Err
Hazard Function	Intercept	-4.745	0.184	-4.707	0.284	-4.473	0.159	-4 426	0 413
	Time	-0.031	0.002	-0.032	0.004	-0.029	0.002	-0.023	0.005
	Time Squared	0.000	0.000	0.000	0.000	0.000	0 000	0.000	0.000
	Time Inverse	-0.608	0.114	-0.142	0.198	-0.324	0.091	0.164	0.256
	Week 9	0.236	0.083	0.226	0.136	0.275	0.071	0.148	0 190
	Week 10	0.656	0.084	0.314	0.163	0.605	0.075	0.802	0.190
	Week 11	0.176	0.091	0.121	0.150	-0.053	0.087	-0.523	0.276
	Week 12	0.163	0.093	-0.076	0.165	0.258	0.077	0.055	0.215
	Week 13	-0.127	0.108	-0.182	0.175	-0.198	0.097	0.177	0.207
	Week 14	0.447	0.102	0.372	0.191	0.511	0.087	0.489	0.274
	Week 15	-0.043	0.110	0.106	0.159	-0.147	0.099	-0.110	0.245
	Week 10 in 1990	-0.088	0.148			-0.258	0.138		
	Week 14 in 1990	0.084	0.170	-0.104	0.261	0.270	0.134	-0.207	0.423
	Not Covered by UI	N/A		-0.131	0.164	N/A		0.090	0.232
	Not Covered by UI * Week 10	N/A		0.036	0.273	N/A		-0.561	0.348
	Not Covered by UI * Week 14	N/A		0.453	0.254	N/A		-0.335	0.408
	Not Covered by UI * Time	N/A		0.005	0.006	N/A		0.003	0.009
	Not Covered by UI * Time Squared	N/A		0.000	0.000	N/A		0.000	0.000
	Not Covered by UI * Time Inverse	N/A		0.244	0.317	N/A		-0.351	0.436
	Provincial Unemployment Rate	0.014	0.013	-0.054	0.024	0.036	0.013	-0.075	0.036
Month	January	-1.083	0.117	-1.205	0.159	-1.130	0.098	-1.166	0.217
	February	-1.072	0.111	-1.327	0.161	-0.945	0.087	-1.471	0.235
	March	-0.741	0.084	-0.877	0.117	-0.699	0.069	-0.675	0.152
	April	-0.784	0.091	-0.959	0.128	-0.942	0.080	-0.929	0.181
	May	-0.720	0.084	-0.852	0.120	-1.063	0.078	-0.654	0.156
	June	-0.518	0.069	-0.274	0.090	-0.813	0.061	-0.542	0.135
	July	-0.658	0.072	-1.057	0.126	-0.845	0.062	-1.161	0.177
	August	-0.165	0.062	-0.703	0.110	-0.459	0.055	-0.574	0.143
	September	0.174	0.057	-0.595	0.096	-0.038	0.049	-0.577	0.133
	October	0.115	0 061	-0.906	0.111	0.128	0.050	-0.513	0.136
	November	-0.220	0.065	-0.699	0.098	0.079	0.049	-0.624	0.135
	December	N/A		N/A		N/A		N/A	
Age	**16 Years old in 1988**	N/A		N/A		N/A		N/A	
	17 to 19 Years old in 1988	-0.137	0 102	0.182	0.121	-0.075	0.085	0.065	0.121
	20 to 24 Years old in 1988	-0.080	0.101	0.225	0.124	-0.162	0.084	-0.010	0.144
	25 to 34 Years old in 1988	-0.034	0 098	0 180	0.115	-0.095	0.083	0.033	0.144
	35 to 44 Years old in 1988	-0.103	0 101	0.225	0.118	0.027	0.086	-0.211	0.167
	45 to 54 Years old in 1988	0 059	0.105	0.191	0.135	-0.028	0.092	0.041	0.175
	55 to 64 Years old in 1988	0.378	0.128	0.574	0.165	0.202	0.099	-0.057	0.221
Household Type	**Single Adult**	N/A		N/A		N/A		N/A	
	Married Adult	-0.010	0.059	-0.095	0.102	-0.038	0.048	0.074	0.143
	Married Adult with Child(ren)	0.153	0.051	-0.045	0.083	-0.009	0.039	0.359	0.110
	Single Adult with Child(ren)	0.130	0.070	0.125	0.109	0.112	0.067	0.557	0.155
Employment Equity	**Canadian born White**	N/A		N/A		N/A		N/A	
Group	Visible Minority	0.061	0.182	-0.087	0.248	0.044	0.143	-0.143	0.299
	Immigrant	-0.110	0.087	-0.087	0.121	0.019	0.073	-0.126	0.423
	Visible Minority Immigrant	-0.033	0.230	0.202	0.336	-0.470	0.199	0.046	0.184

Appendix Table 2

Type of Variable	Variable Label	Full Time Beta	Full Time Std Err	Part Time Beta	Part Time Std Err	Full Time Beta	Full Time Std Err	Part Time Beta	Part Time Std Err
Education	**Less than High School**	N/A		N/A		N/A		N/A	
	High School	0.185	0.048	0.080	0.082	0.122	0.037	-0.035	0.119
	Some Post-Secondary	0.089	0.050	-0.123	0.080	0.037	0.042	-0.238	0.127
	Post-Secondary Certificate	-0.067	0.061	-0.119	0.089	0.017	0.050	-0.555	0.133
	University Degree	0.058	0.058	-0.155	0.087	-0.183	0.057	-0.099	0.136
Language	French Speaker in Quebec	0.391	0.137	0.147	0.184	0.125	0.107	-0.188	0.242
	English Speaker outside Quebec	0.123	0.067	0.119	0.116	0.198	0.055	0.119	0.182
Province	British Columbia	0.184	0.077	0.319	0.116	0.109	0.067	0.643	0.165
	Alberta	-0.021	0.068	0.052	0.093	0.023	0.056	0.359	0.129
	Saskatchewan	0.039	0.086	0.106	0.109	0.191	0.068	0.348	0.152
	Manitoba	0.265	0.082	0.455	0.112	0.221	0.072	0.620	0.160
	Ontario	N/A		N/A		N/A		N/A	
	Quebec	0.131	0.144	0.767	0.201	0.187	0.117	1.028	0.267
	Nova Scotia	0.447	0.081	0.491	0.136	-0.024	0.079	0.770	0.201
	Prince Edward Island	0.593	0.114	1.049	0.225	0.190	0.121	0.561	0.366
	New Brunswick	0.477	0.097	0.777	0.171	0.137	0.092	0.798	0.266
	Newfoundland	0.565	0.242	1.549	0.442	0.037	0.230	1.897	0.670
Wage	Hourly Wage	-0.048	0.006	-0.003	0.005	-0.024	0.003	-0.010	0.006
Labour Power	Union	-0.134	0.050	-0.265	0.083	0.037	0.038	-0.281	0.119
	Collective Bargain (No Union)	0.150	0.073	-0.153	0.116	0.227	0.064	0.308	0.140
	Pension Coverage	-0.783	0.056	-0.521	0.101	-0.585	0.041	-0.204	0.148
	Federally Regulated Sector	0.810	0.114	1.262	0.211	0.393	0.114	0.065	0.316
Firm Size	**19 or Fewer Employees**	N/A		N/A		N/A		N/A	
	20 to 99 Employees	-0.101	0.046	-0.173	0.078	-0.120	0.038	-0.118	0.100
	100 to 499 Employees	0.033	0.057	-0.016	0.090	0.015	0.046	-0.106	0.127
	500 or More Employees	0.018	0.047	-0.093	0.070	-0.166	0.041	-0.430	0.102
Weekly Hours	Hours	0.008	0.002	0.018	0.007	0.007	0.001	0.017	0.010
Occupation	**Clerical**	N/A		N/A		N/A		N/A	
	Managers	-0.180	0.079	0.064	0.167	-0.754	0.100	-0.512	0.281
	Science, Math and Architecture	-0.321	0.169	-0.672	0.590	-0.298	0.107	-0.289	0.445
	Social Science	-0.039	0.115	-0.165	0.188	-0.070	0.161	-0.155	0.328
	Religion	-1.170	1.039						
	Teaching	0.012	0.105	0.200	0.121	-0.272	0.167	0.447	0.231
	Medical	-0.568	0.151	-0.610	0.187	-0.415	0.248	-0.444	0.556
	Arts and Recreation	0.177	0.132	0.559	0.147	0.347	0.121	0.771	0.203
	Sales	0.039	0.078	0.063	0.104	-0.221	0.092	-0.322	0.191
	Services	0.121	0.060	-0.040	0.090	0.176	0.078	0.134	0.159
	Agriculture	0.570	0.139			0.513	0.109	0.988	0.263
	Fishing, Hunting and Trapping	0.386	0.258			0.292	0.155	0.586	0.469
	Forestry and Logging	1.033	0.214			0.708	0.112	-0.162	0.507
	Mining	0.268	0.636			0.418	0.139	0.251	0.537
	Processing	0.325	0.092	0.477	0.212	0.342	0.075	0.080	0.240
	Metalwork	0.307	0.246			0.213	0.087		
	Fabricating	0.525	0.107	0.179	0.272	0.140	0.077	0.009	0.227
	Construction	0.927	0.159			0.671	0.078	0.814	0.314
	Transportation	-0.019	0.179	0.708	0.185	0.180	0.082	0.222	0.193
	Material Handling	0.354	0.110	0.196	0.229	0.435	0.083	-0.188	0.196
	Other Operators	0.127	0.211	-0.055	0.378	-0.259	0.172	-0.260	0.603

Appendix Table 2

Type of Variable	Variable Label	Full Time Beta	Full Time Std Err	Part Time Beta	Part Time Std Err	Full Time Beta	Full Time Std Err	Part Time Beta	Part Time Std Err
Industry	Forestry and Logging	0.963	0.198	1.927	0.376	0.648	0.106	2.006	0.436
	Fishing, Hunting and Trapping	0.678	0.252	1.521	0.341	0.471	0.153	1.002	0.425
	Metal Mines	1.018	0.534			-0.107	0.157	1.727	0.874
	Mineral Fuels	-0.045	0.510			-0.104	0.190	0.937	0.638
	Non-Metal Mines	3.129	0.403			0.791	0.200	0.762	0.591
	Quarries and Sand Pits	0.735	0.594			0.669	0.204		
	Services Incidental to Mining	-0.929	1.007			0.525	0.131		
	Food and Beverage	0.925	0.100	1.085	0.206	0.527	0.076	1.068	0.222
	Tobacco Products	1.910	0.728						
	Rubber and Plastic Products	0.273	0.261	1.148	0.498	0.041	0.181	0.735	0.604
	Leather Products	0.184	0.333			0.518	0.460		
	Textile and Knitting Mills	0.501	0.209	1.150	0.480	0.320	0.253		
	Clothing	0.383	0.159	0.541	0.408	0.296	0.297		
	Wood Industries	0.970	0.199	1.041	0.521	0.408	0.083	0.756	0.392
	Furniture and Fixtures	0.665	0.284	1.103	0.468	0.644	0.173		
	Paper and Allied Industries	0.439	0.274			0.413	0.113	0.970	0.500
	Printing-Publishing and Allied	0.402	0.182	0.443	0.270	0.110	0.214		
	Primary Metal	0.281	0.416	1.188	1.013	0.324	0.145		
	Metal Fabricating	0.506	0.282	0.752	0.601	0.378	0.123	0.496	0.530
	Machinery Industries	0.849	0.287			0.234	0.145	1.015	0.735
	Transportation Equipment	0.700	0.192	0.625	0.605	0.442	0.102		
	Electrical Products	0.477	0.210	1.209	0.606	0.278	0.184		
	Non-Metallic Mineral Products	0.913	0.283	0.440	0.718	0.345	0.136	0.650	0.735
	Petroleum and Coal Products	1.884	0.518			0.540	0.188		
	Chemical and Chemical Products	-0.541	0.415	0.086	0.717	0.188	0.189	1.718	0.628
	Miscellaneous Manufacturing	0.240	0.252	1.001	0.614	-0.006	0.207	1.099	0.609
	General Contractors	-0 030	0 148	-0.482	0.276	-0.175	0.116		
	Storage	1.021	0.392			1.093	0.242	1.741	0.617
	Communication	-0.458	0.188	-0 441	0.281	-0.912	0.191	0.156	0.392
	Electrical Power, Gas and Water Utilities	0.670	0.226	0.841	0.725	0.115	0.135	1.138	0.555
	Wholesale Trade	0.278	0.122	0.404	0.189	0.022	0.076	0.174	0.235
	Retail Trade	N/A		N/A		N/A		N/A	
	Finance Industries	-1.660	0 219	-1.380	0.285	-0.905	0.334	-1.650	1.047
	Insurance Carriers	-0.268	0.250	0.287	0.511	-0.817	0.413		
	Insurance Agencies and Real Estate	-0 047	0.164	0.155	0.302	-0.201	0.166	0.230	0.289
	Education and Related Services	0.962	0 098	1.032	0.125	0.283	0.120	0.656	0.197
	Health and Welfare Services	0 011	0 099	0 146	0.137	-0.075	0.137	-0.266	0.280
	Religious Organisations	0.163	0.277	-0.293	0.420	-0.063	0.276	-0.154	0.523
	Amusement and Recreational Services	0.770	0.113	0.940	0.155	0.514	0.106	0.576	0.194
	Services to Business Management	0.366	0.098	0.637	0.160	0.246	0.099	0.155	0.248
	Personal Services	0.312	0.107	0.553	0.164	-0.133	0.191	0.302	0.382
	Accomodation and Food Services	0.247	0.083	0.389	0.124	0.119	0.087	-0.172	0.174
	Miscellaneous Services	0.605	0.105	0.081	0.174	0.267	0.094	0.304	0.210
	Federal Administration							0.559	0.336
	Provincial Administration	0.991	0.103	1.158	0.202	0.669	0.100	0.891	0.331
	Local Administration	0.818	0 114	1.017	0.178	0.521	0.089	0.974	0.205

Notes: **Bold** denotes the left out category in a set of dummy variables

Derivatives in Table 3 are estimated at the data means as follows. Given mean layoff probability P^* and estimated coefficients, B, $dP/dX = BP^*(1-P^*)$

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DRAFT

Perspectives on Working Time Over the Life Cycle

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ABSTRACT

There is growing interest in statistical patterns of working time over the life cycle. A new longitudinal microsimulation model, LifePaths, is used to provide a variety of coherent views of such patterns. The model is a generalization of multi-state life table methods, and blends data on both cross-sectional time use patterns and longitudinal labour force dynamics. It relaxes many of the restrictive assumptions in conventional working life tables, which tend to include only a few variables, and entry to and exit from the labour force based only on first-order markov dynamics. The more detailed microdata results generated by LifePaths both enable and necessitate graphical "data visualization" approaches to appreciate the multivariate character of the results.

Introduction

A central topic in social statistics is patterns of work in a population. In addition to the longstanding interest is basic information like unemployment rates and employment / population ratios, there is increasing interest in the way individuals' working careers unfold over their lifetimes. The conventional (male) life story of attending school, entering the labour market, pursuing a career, and then retiring is widely questioned. Among the reasons are the increased numbers of women in paid work, shifting unpaid work roles within the family, concerns about leisure time, and a sense that the labour market is becoming more turbulent.

However, the requisite longitudinal data on such aspects of working careers are generally unavailable. As a result, statistical impressions are generated either by examining trends in cross-sectional age-specific patterns, or by piecing together data using synthetic statistical methods. In the first case, a sequence of cross-sectional labour force or time use survey data is analysed. Time use data in particular are very richly detailed, but only a few such surveys are available. With either kind of data, these are cross-sectional surveys combining data from overlapping birth cohorts, and so are limited in providing a life cycle perspective

The second approach for assessing patterns in working time over the life cycle is working life tables. These are extensions of conventional life tables where the focus is entry to and exit from the labour force. However, this approach is quite restricted in the character of the labour force dynamics which can be taken into account -- essentially only age/sex-specific first order markov transition probabilities. Yet there is strong evidence that these transitions depend importantly on a wide range of other factors such as educational attainment, nuptiality, and fertility history.

Statistics Canada has recently developed a new microsimulation model, LifePaths (Wolfson, 1995). This model generalizes the ideas inherent in working life tables, and integrates data from the 1992 General Social Survey on time use patterns (Statistics Canada, 199X). Thus, it offers a means to estimate and display coherent pictures of work and other kinds of time use over various time scales ranging to the full life cycle.

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[1] Statistics Canada and the Canadian Institute for Advanced Research, and Statistics Canada respectively. The work reported here is very much a team effort, principally by members of the Socio-Economic Modeling Group of the Analytical Studies Branch, Statistics Canada; though we remain responsible for any errors or infelicities in this paper.

Figure 1-b: Population Age 15+ by Age, Sex, and Employment Status, 1991 (%)

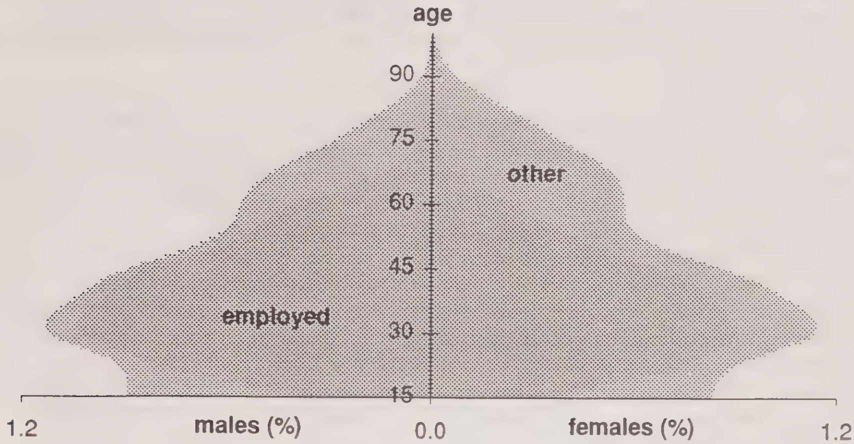
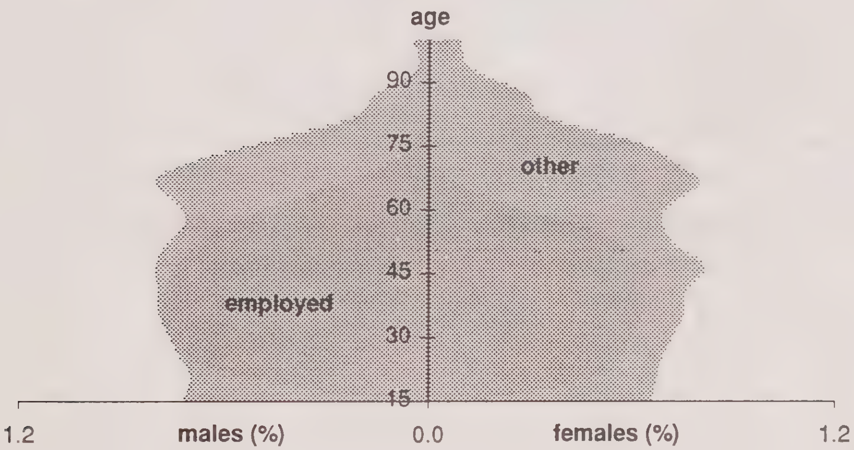


Figure 1-c: Population Age 15+ by Age, Sex, and Employment Status, 2031 (%)



The other, and less often presented, perspective on working time over the life cycle draws of life table methods. The first such estimates for Canada were Denton and Ostry (1969), in turn updated by Gnanesekaran and Montigny (1975). More recently, Belanger and Larrivee (1992) have made multi-state life table estimates.

The original results required only limited cross-sectional age-specific labour force participation and mortality rate data, which was appropriate given the long historical series that was estimated. Specifically, the life tables included two living states – working, and not working ("inactive"). Transitions between these states were based on age-specific labour force participation rates (for males only), and a series of simplifying assumptions. The key assumptions were that gross flows into and out of work exactly equaled

net flows -- an individual could only enter and leave the labour market once over their entire lifetime, and that overall, labour force participation rates first rise monotonically to an age where they are at a maximum, and then fall monotonically. Thus, up to the age of the maximum participation rate a* (around age 30 in 1971), the rate of entry to the labour force at each age was assumed to equal the difference in the part rate between ages a-1 and a (plus the mortality rate). After age a*, only exits from the labour force are assumed, again equal the difference in the part rate between ages a-1 and a (assuming mortality rates are independent of labour force status).

The more recent increment-decrement methods used by Belanger and Larrivee were able to relax these restrictive assumptions on transitions into and out of the labour force by using longitudinal microdata from the Labour Market Activities Survey (LMAS). These data allow gross flow transition probabilities to be estimated directly -- rather than having to infer them based on an assumed equality with net flows derived by first-differencing age-specific participation rates. As a result, multiple exits and re-entries to the labour force over a lifetime are not ruled out *a priori*, as in the earlier working life tables. For example, they estimate an average of 2.6 labour force entries for men over their lifetimes using the gross flow approach, compared to 0.94 using the net flow approach (0.94 being the maximum participation rate at age a*). However, strong simplifying assumptions are still embodied in the analysis. In particular, transition probabilities into and out of the labour force are assumed to be first order markov, depending only on age, sex, and labour force status in the year. This ignores more persistent patterns of labour force participation over a number of years, and other factors like educational attainment, marital status, and fertility.

Moreover, both kinds of life table analysis take the calendar year as the smallest time period, and treat working within the year as a dichotomous variable. There is no accounting for part-time or part-year rather than full-time full-year work, and nothing on unpaid work.

Table 1 shows the two sets of estimates of working life expectancy in a comparable fashion. Notwithstanding the various simplifying assumptions, this series of male working life table results vividly displays the long run trends of more time spent in schooling, ever earlier ages of retirement, a general reduction in working years, and hence a long run decline in the ratio of working to inactive or retired years.

The last two rows give Belanger and Larrivee's results for 1986, first using the older gross = net flow assumption (the 1986a row), and then using an increment-decrement life table based on gross transition probabilities (the 1986b row). The rather large 5.2 year difference in expected working life in these last two rows is indicative of the sensitivity of these kinds of results to the detailed assumptions on transition rates.

Table 1 -- Historical Stationary Male Life and Working Life Expectancies at Age 15

	Average at at			Number of Years	
Year	LF Entry	Retirement	Death	Working	Retired
1921	17.5	62.7	67.6	45.2	4.9
1931	18.0	63.0	68.4	45.0	5.4
1941	18.2	63.1	69.1	44.9	6.0
1951	18.5	62.9	70.4	44.4	7.5
1961	19.2	63.0	71.2	43.8	8.2
1971	19.8	62.3	71.3	42.5	9.0
1986a	20.0	65.5	73.8	44.6	8.3
1986b	20.0	60.3	73.8	39.4	13.5

Source: Adapted from Gnanasekaran and Montigny for decades 1921 to 1971 (Tables 2.1 and 12, 1975), and Belanger and Larrivee for the two 1986 rows (Tables 1 and 2, 1992)

Notes: The Belanger and Larrivee results were given only at age 16; age 15 results have been extrapolated. Working life expectancy is taken from Table 2 for both the active and inactive populations for the 1986b row. Also, they have only estimated the average age at death, and the expected number of working years, so the average age at retirement and number of years retired were derived based on the simple assumption that the average age at labour force entry was exactly 20. There also appears to be an inconsistency in the Gnanasekaran and Montigny results for 1971 average number of years working in comparison to all their other estimates, so this figure has been

adjusted. The Belanger and Larrivee definition of "working" is having worked at least one hour in a reference week in September of each year. The Gnanasekaran and Montigny definition for 1971 was essentially working or looking for work in the week prior to census enumeration, but then excluding summer students.

LifePaths -- A Microanalytic Approach

As an alternative to the multi-state life table approach, it is possible to generate analogous but much more richly detailed impressions of working time over the life cycle using microsimulation methods. This kind of approach is grounded in the simulation of a representative sample of individual life paths, in contrast to the cell-based methods of multi-state life tables. As noted in Wolfson and Manton (199X), a microanalytic approach can always be devised that nests any given multi-state life table analysis as a special case.

LifePaths is an instance of such a microanalytic approach. It is a monte carlo longitudinal microsimulation model designed, among other things, to support generalizations of working life tables. Like any empirical socio-economic model, LifePaths draws on multiple data sets, since no one data set contains all the required information. Analytical results like transition probability functions are estimated from various data sources. The simulation model then serves as an "inferential apparatus". The LifePaths apparatus serves as a repository for diverse empirical results, and as an inference engine where these results are synthetically integrated and their joint implications drawn out.

LifePaths achieves this objective by synthesizing realistic sets of full individual life cycle histories, with each set representing an period birth cohort. Generalized working life expectancies and associated life tables are then byproducts. It is simply a matter of cross-tabulating the individual life histories comprising the cohort to construct a working life table results analogous to those just presented. In addition, LifePaths' explicit microdata foundations enable a wide range of "views" of cohort work patterns over the life cycle.

LifePaths is based on the DEMOGEN microsimulation model (Wolfson, 1989), and the new post-secondary education Income Contingent Repayment Loan (ICL) model developed for the Human Resources Development Ministry of the Government of Canada. The ICL model, in turn, has drawn substantially on analysis of the Labour Market Activities Survey (LMAS), which provides detailed longitudinal data on labour market dynamics over the 1988 to 1990 period. For this analysis, extensive use has also been made of the 1992 General Social Survey (GSS), which includes detailed questions on daily time use.

As with the radix of a conventional life table, LifePaths starts with a specified population of individuals, say 100,000 births. Unlike a life table, which follows groups of individuals, LifePaths generates one individual at a time, and follows him or her until their death. A life table implicitly assumes individuals are basically homogeneous. For example, in the Belanger and Larrivee working life table results shown above, at each age any individual can only be of two "kinds", working or not. LifePaths, in contrast, allows individuals to be highly heterogeneous, since each individual's life path is uniquely simulated. Also, LifePaths models individual dynamics in continuous time, whereas a life table typically uses a discrete annual time step. The life table results above are based on first order markov transition probabilities, while LifePaths uses semi-markov processes, usually represented by multivariate hazard functions or waiting time distributions. At any moment in time, an individual faces chances of making a number of transitions. For example, depending on his or her current state or set of attributes, this could be a transition into the labour force, or into a marital union.

In the current version of LifePaths, individuals are jointly characterized by the following basic attributes at each point in their lives:

- age -- as a continuous variable
- fertility – exact ages at the birth of children, presence of children in the familial home
- nuptiality -- unattached, in a common-law or marital union, separated, or divorced
- work status -- including labour force participation and employment status (hours per week, weeks in the year)
- school status -- grade and type of institution if attending, educational attainment otherwise

- work income -- hourly rate, weekly and annual earnings
- time use – 17 categories including various kinds of work, learning, leisure, and personal care
- spouse attributes -- including age, educational attainment, labour market experience

In addition, a wide range of derived attributes can be constructed from these basic attributes.

The core of the LifePaths model is the set of processes by which the trajectories for each attribute is generated. A brief sketch is given in the following paragraphs.

Demography -- Fertility is modeled as the sequel to conception, which in turn is modeled as a series of piecewise constant hazard rates, conditional on age, marital status, and number of previous live births. The main data source is birth registrations, supplemented by data from the 1983 Family History Survey to account for biases arising from conceptions while single or in a common law union that are then followed by a marriage before the birth of the child. Mortality rates are conditional on age, sex and marital status, and are based on death registrations. In both cases, the population census provides the denominators.

Union formation and dissolution are represented by a series of hazard functions (Rowe, 198X). From the single state, there are competing risks of entering a common-law union or a legal marriage. Marriage breakdown involves risks of separation and subsequent divorce. These hazards have been separately estimated for men and women, and depend in a complex way on previous history. For example, females' "risk" of entry to a union is positively related to being pregnant, and is highest shortly following labour force entry. Risks of separation for females are higher if there are no young children at home, if the woman was a teenage bride, and if the woman has recent work experience.

Educational Progression -- Transition rates for progression through elementary and secondary school were constructed to be as close to jointly consistent as possible with the 1986 and 1991 population census data on the school attendance rates of children of the relevant ages. Progression through post-secondary institutions (colleges, trade schools, universities) is based on hazard rates jointly estimated from the National Graduates Survey (NGS), administrative data on school enrollments, and the Labour Market Activities Survey (LMAS) for cases where young people quit work to return to and continue their studies.

Labour Market -- Labour market experience is simulated in two main parts -- whether or not employed, and earnings from employment. The first of these, transitions into and out of employment, is estimated from the LMAS separately for males and females, and also separately for first entry, second and subsequent entry, and exit from employment. First entry is represented by waiting time distributions, while the other transitions are represented by multivariate hazard functions. Sex and educational attainment are important determinants of the waiting time to first employment. Re-entry hazards depend on sex, educational attainment, and duration of the current spell of non-employment, and for women the presence of infant children has an additional depressing effect.

Earnings are in turn based on employment status as just described, and separate models for weekly hours of work, and hourly wages. Upon first entry to employment, a weekly hours value is randomly assigned, drawn from an age-, sex- and educational attainment-specific distribution, in turn based on data from a combination of the NGS, LMAS, and the Survey of Consumer Finances (SCF -- the annual household income distribution survey). Subsequently, the weekly hours variable is updated as a function of age, sex, last year's weekly hours, and educational attainment. At the same time that weekly hours is assigned, each individual is assigned a percentile rank for hourly earnings. The hourly earnings rate is then "looked up" from age-, sex- and educational attainment-specific distributions. Percentile ranks are adjusted from year to year based on estimates of rank order "churning" from the LMAS.

Daily Time Use -- The 1992 General Social Survey (GSS) collected 24 hour time use diary data for about 9,000 individuals, evenly distributed by age, sex, day of the week, and month of the year. The GSS also collected basic data on educational attainment, employment status, and family status. After extensive analysis of these data, a LifePaths module was created which imputes to every simulated person-day one vector of time spent over a 24 hour period in each of a series of 17 activities. (Special assumptions have been made for children under age 15 and those elderly living in institutions, since they were not covered by the GSS.)

The statistical analysis indicated that age, sex, day of the week, marital status, presence of young children, educational attainment, and main activity (i.e. student, employed or self-employed, other) were all significantly associated with these vector patterns. Thus, all of these attributes, as generated by other LifePaths processes, were used in the imputation. The imputation process was also designed to reproduce the observed variability in time use patterns amongst individuals with the same attributes, essentially by using the distribution of vector residuals from a multivariate regression analysis. Further details are given in the appendix.

The richly multivariate life cycle histories generated by a LifePaths simulation enable basic working life table results to be extended in several directions. Annual patterns of paid work can be examined in more detail, going beyond a two-way breakdown between working and non-working years. For example, part-time work, hours worked per week, sub-annual spells of unemployment or withdrawal from the labour force, periods where work and schooling are simultaneously pursued, and self-employment are all taken into account. In addition, the time aspects of work are combined with earnings, formal schooling, and familial context (e.g. living alone or with other family members). Moreover, LifePaths' explicit microdata foundations enable impressions of individual heterogeneity.

Preliminary Results

Before presenting results based on LifePaths simulations, Figures 2-a,b and c show the 1992 GSS time use patterns in a manner analogous to the population pyramids in Figure 1. However, instead of distributing total person-years in the population by age, sex, and two employment categories as in Figure 1, these figures show the distribution of total person-hours in the population by age, sex, and type of activity. In addition, these 1992 detailed time use patterns have been combined with the same population data for 1961, 1991, and 2031 as were used in Figure 1. In the cases of 1961 and 1991, the census data were used to re-weight the GSS sample to correspond not only to counts of individuals by age and sex, but also by labour force status, census family size, and the age of the head of the census family. In the case of the data for 2031, corresponding control totals were used for re-weighting. However, these totals were based on the same projections of numbers of individuals by age, sex and labour force status as in Figure 1, as well projections of families from Statistics Canada's FADEP (FAmily DEmographic Projection) model, so the results should be treated as speculative.

Perhaps the most dramatic change from Figure 1 to Figure 2 is in the apparent importance of paid work. Using a binary classification on person-years as in Figure 1 gives the impression that employment is a major use of time. On the other hand, using daily hours as in Figure 2 suggests that paid work is of much lesser relative importance in the daily (or even waking) lives of Canadians. This set of figures also indicates the limitations of conventional demographic dependency ratios, which use raw counts of individuals of working age (e.g. age 20 to 64) as the denominator. In the context of Figure 2, such ratios clearly understate the degree of economic dependence of many individuals in society.

Figure 2-a: Total Population Age 15+ by Age, Sex, and Main Activity, 1961

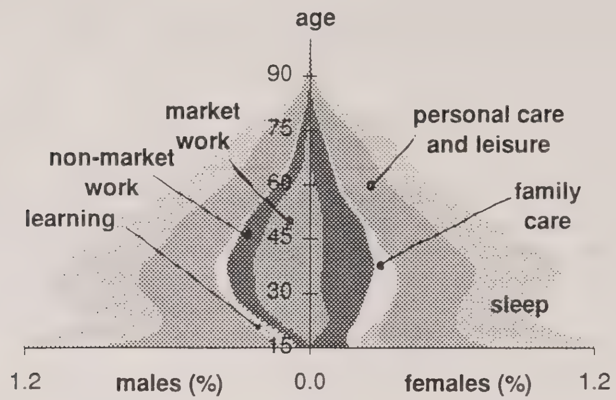


Figure 2-b: Total Population Age 15+ by Age, Sex, and Main Activity, 1991

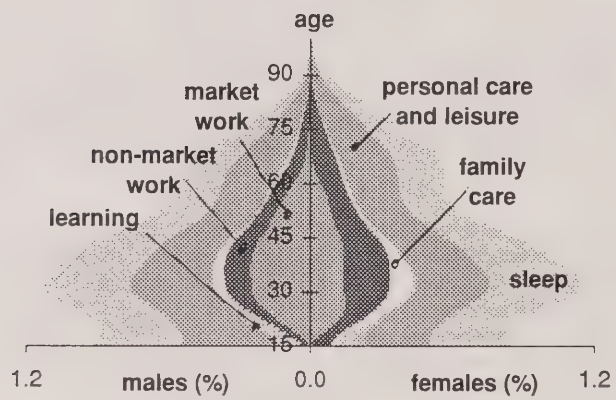
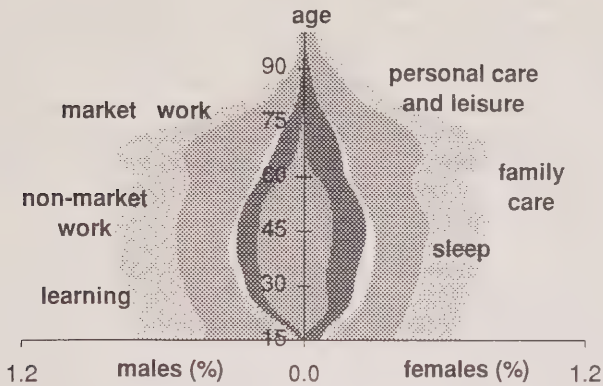


Figure 2-c: Total Population Age 15+ by Age, Sex, and Main Activity, 2031



Basic LifePaths Results

The baseline LifePaths simulation consists, fundamentally, of a sample of complete (synthetic) individual life cycle histories. This longitudinal micro data base of sampled life histories is too complex to be examined directly, so we offer here only selected summary "views" of the underlying microcosm.

To start, Figure 3 shows the population pyramid for the base case simulation scenario. This is similar to Figure 1 except that the population envelope is the steady-state or period life table population, rather than an actual population distribution by age and sex. It is based on late 1980s and early 1990s transition probability functions, as sketched above. As expected, at higher ages, the survival curve for females falls more slowly than that for males, a counterpart to (or more accurately the underlying reason for) females' higher life expectancy. (The blip in the age 99 interval reflects the fact that this is actually the age ≥99 interval.)

Figure 3: LifePaths Population (person-years) by Major Activity, Age and Sex

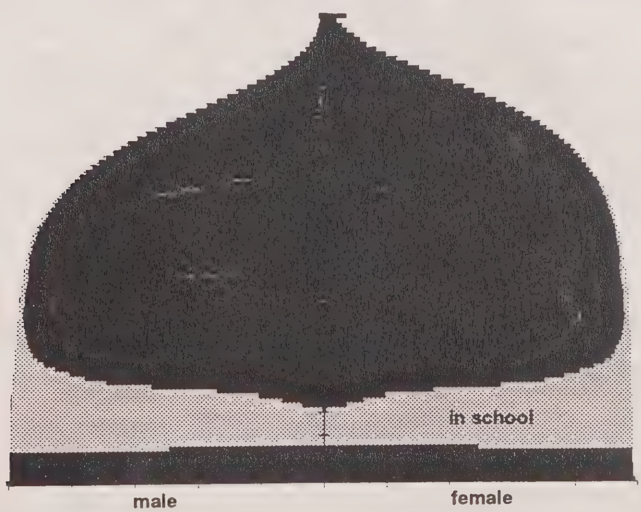
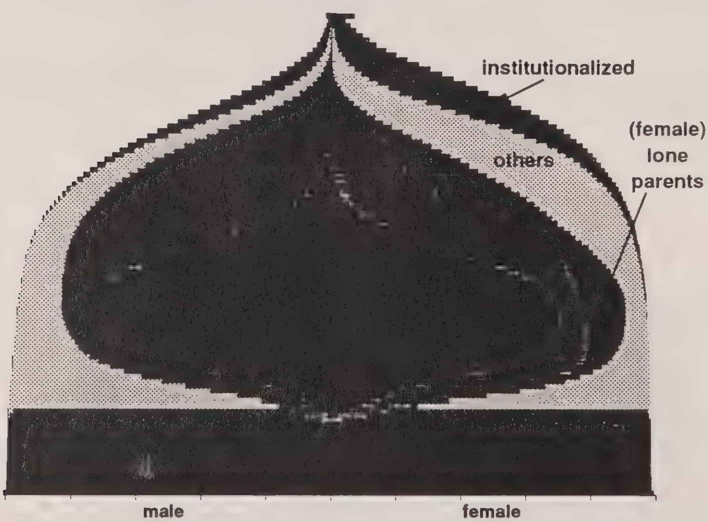


Figure 3 also shows the population broken down into three socio-economic categories -- "employed", in "school", and "other". "School" starts at grade 1, so daycare and kindergarten are part of "other". Since the LifePaths framework tracks individuals through time continuously, some arbitrary decisions have been applied in years where individuals engage in more than one activity. Specifically, for a person-year to be considered "employed" in this diagram, the individual had to be working at least 15 hours per week, and the plurality of time during the year had to be spent working at this rate. Thus, someone who spent 5 months as a student, 4 months working at least 15 hours per week, and the remaining 3 months of the year working less than 15 hours per week (including not working at all) would be considered in "school" that year; while if the 5 and 4 were reversed, they would be considered "employed". (Definitions such as these are under the control of the LifePaths user.) The diagram shows that virtually everyone is in school by age 8, a few start leaving at age 16, most have left by age 20, but there is a tail of both males and females who are in school through their twenties.

No one appears to make a transition directly from school to employment, though we return to this point in a later figure. Instead, perhaps a surprising proportion of individuals are in the "other" category, which includes the unemployed as well as those not in the labour force (e.g. homemakers, the retired). As expected, males are more likely to be employed at various ages than are females. The employed portion of the population shows a dip in the age-related trend to higher participation for women in the prime child-bearing years 20-25, and then something of an acceleration in the 25-35 age range. Men show a relatively sharp decline in participation in the age 60-65 age range.

Parenthetically, Figure 3 corresponds to Sir Richard Stone's "active sequence" (i.e. transitions among working and learning states) in his proposed System of Social and Demographic Statistics (SSDS; United Nations, 1975), while Figure 4 gives an overview of his "passive sequence", the other maon demographic focus in the SSDS. It uses the same population pyramid graphic form, and refers to exactly the same underlying LifePaths synthetic population, but classifies individuals along a different dimension, family status. By definition, all individuals under age 18 are classified as "growing up" unless they are married or have a child. Also, whenever a marriage breaks down, any children are assumed to remain with the mother. This assumption explains why there are female, but no male lone parents. (Future versions will incorporate more realistic data on custody arrangements.)

Figure 4: LifePaths Population (person-years) by Family Status, Age, and Sex



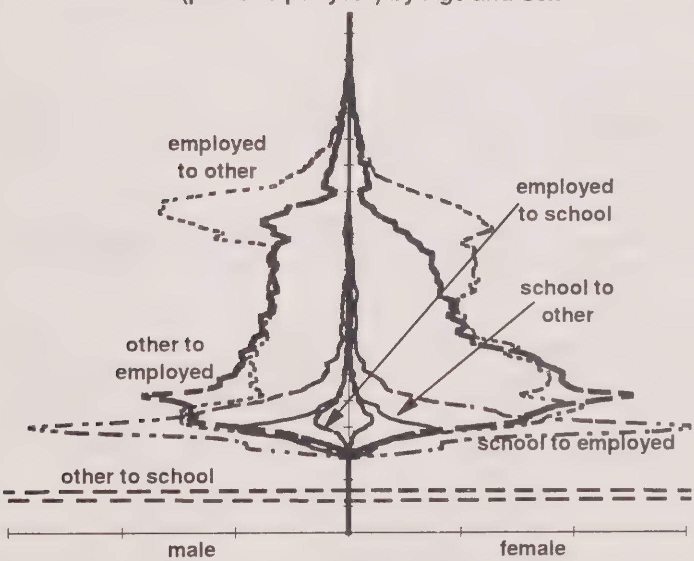
Comparing the male and female curves for the married states (couples with and without children) shows the male curves displaced a few years toward higher ages. This is a reflection of the general pattern where husbands tend to be a few years older than their wives. The diagram also shows there are many more widows than widowers ("others" at higher ages). This is a consequence of both the positive average

age difference between husbands and wives, and the greater life expectancy of women. Finally, the diagram indicates the much higher rates of institutionalization of women (principally in nursing or chronic care facilities), due in turn to their greater longevity and higher prevalence of health problems at older ages, and the fact that similarly incapacitated males more often have a wife who can care for them at home.

Figures 3 and 4 show only two rather straightforward "views" (in this case cross-tabulations) of the full underlying LifePaths microcosm – a multivariate longitudinal micro data set for a synthetic "early 1990s" period birth cohort. Exactly this same underlying longitudinal micro data set can be tabulated to generate the view in Figure 5, which shows *flows* between states rather than *stocks* of individuals within each state. In this case, Figure 5 graphs the flows corresponding to the stocks in Figure 3. The horizontal axis shows the number of individuals making each kind of transition each year, again in population pyramid style with age along the common vertical axis. (The extremes of the horizontal axis span 18% of the population, so that for a cohort of 100,000 the maximal male and female flows are each 9,000 per year.)

The first transition is from "other" (early childhood or pre-school) to "school". Figure 3 indicates that all male and female children make this transition by ages 6 and 7. The next major transition is at the end of "school", where the peak flow rate to "employed" occurs around age 20 for both males and females. A smaller number, also peaking at about age 20, move from school to "other" activity. Recall that the "other" category is any person-year where the plurality of the year (i.e. at least a tiny bit more than one-third) was spent neither as a student nor working more that 15 hours per week.

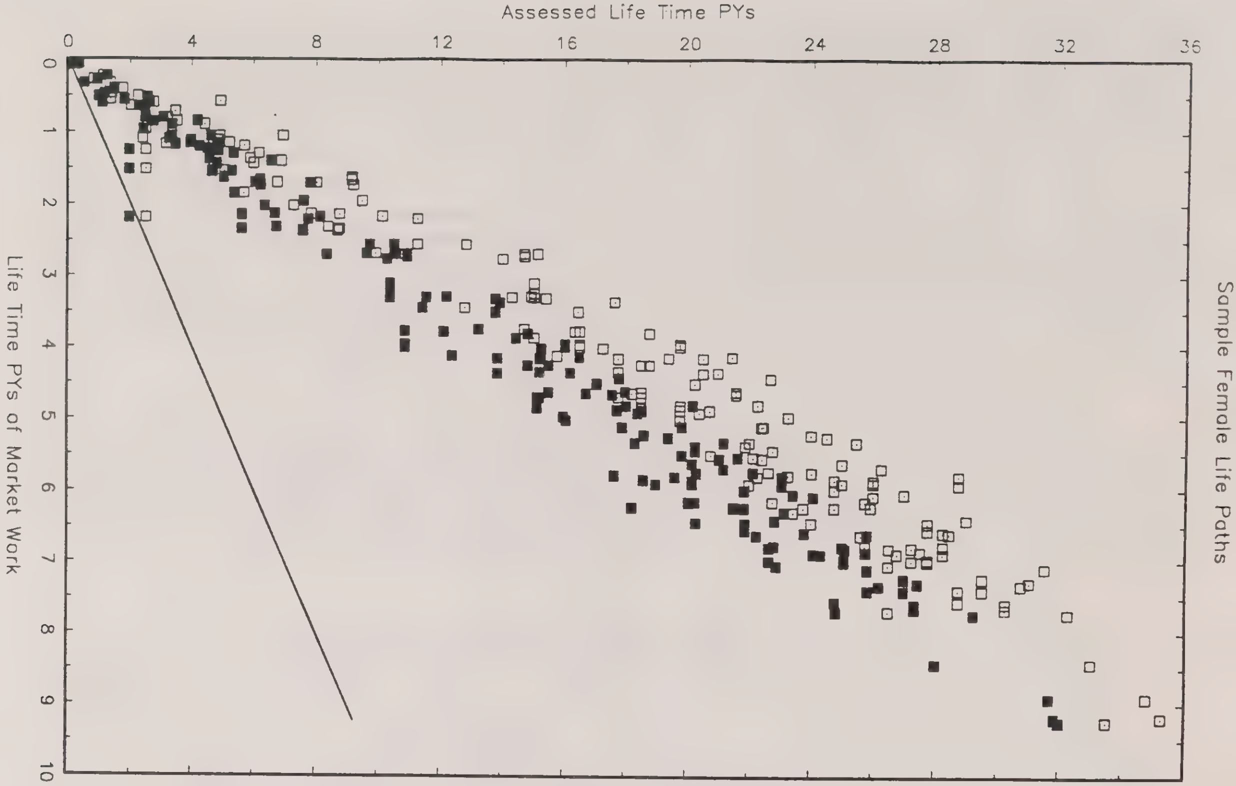
Figure 5 -- LifePaths Gross Flows Between Major Activities (persons per year) by Age and Sex

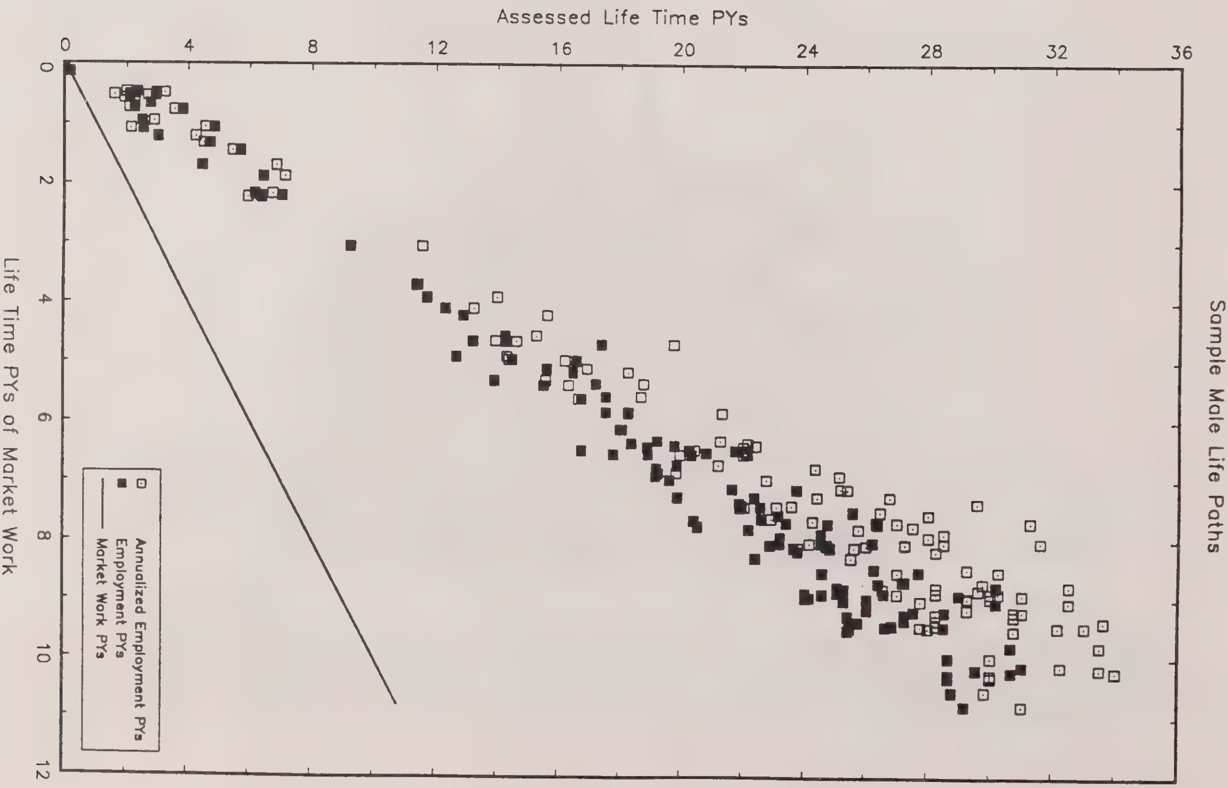


From early adult ages to the 60s, the main flows are between the "employed" and "other" categories. Note that all these flows are gross rather than net. It is notable that the net flow between employed and other (based on comparing the gross flows) shifts direction toward "other" in the 40-45 age range for females, but remains quite small for males through age 50. This is followed by retirement peaks in the 55-65 age range, the one for males being more pronounced.

In addition to stocks and flows of individuals in various categories of activity, LifePaths also supports data views showing sojourn times -- lengths of time individuals spend in various states. Such sojourn times have already been illustrated in Table 1 above, giving earlier estimates of working life expectancy. A major additional capability in LifePaths, given its explicit micro data foundations, is views of uni- or bivariate distributions of durations or sojourn times across the population. For example, Figure 6

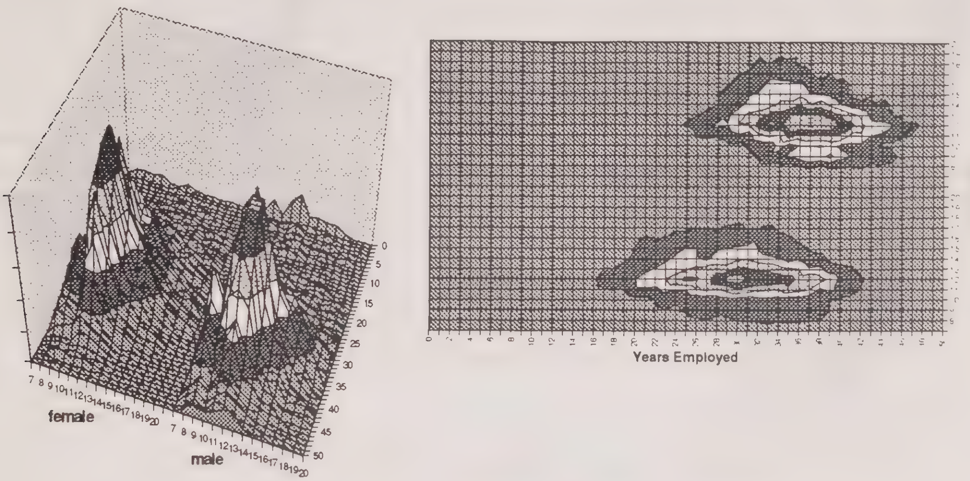
Figure 7


Assessed Life Time PYs
0
4
8
12
16
20
24
28
32
36
Life Time PYs of Market Work
0
1
2
3
4
5
6
7
8
9
10
Sample Female Life Paths


Assessed Life Time PYs
0
4
8
12
16
20
24
28
32
36
Life Time PYs of Market Work
0
2
4
6
8
10
12
Sample Male Life Paths
Annualized Employment PYs
Employment PYs
Market Work PYs

shows the joint distribution for males and females of years spent mainly in school and mainly in employment, as a 3-d plot on the left and as a contour plot on the right.

Figure 6 -- LifePaths Joint Distribution of School and Work Sojourn Times



This pair of graphs indicates modes at around twelve years of school, for both men and women, and about 30 years of employment for women compared to 35 to 40 for men. The expected distribution of years of school is a bit wider for men, while the distribution of years of employment is considerably wider for women.

Note that a year of employment in Figure 6 is defined similarly to an annual average of monthly tlabour force surveys, essentially the proportion of weeks employed. Years of schooling are analogously defined.

However, impressions of working life expectancy are sensitive to the precise way work time is measured. For example, Figure 7 compares three definitions for a sub-sample of individual life histories generated by a LifePaths simulation. The straight line represents lifetime work in hours, based on the most detailed time use data imputed from the GSS. This ranges up to ten years for women, and twelve years for men – where these are years of working 24 hours per day and 365 days per year!

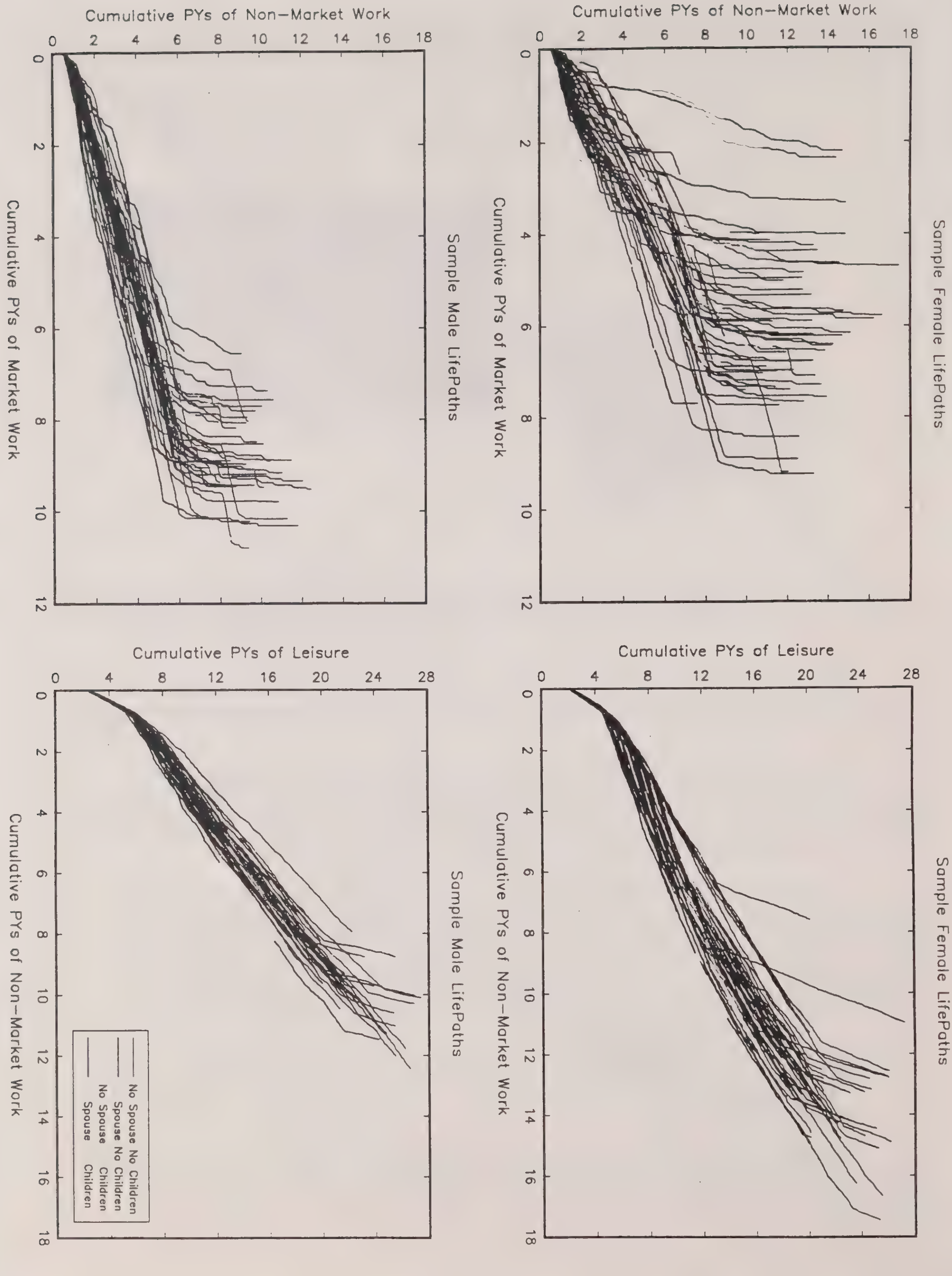
The two clouds of points in Figure 7 represent annualized definitions like those used in Figures 1 and 6 above. The solid squares are like Figure 6, based on the amount of time (essentially week by week) that LifePaths is simulating the individual as "employed" (yes or no, based on labour force dynamics estimated from the LMAS). The hollow squares then apply a calendar year window, and count a year as "employed" if at any time during the year, the individual was "employed" in the sense of the sold squares. This latter definition corresponds to Figure 1 above, where the census data counted an individual as employed if he or she had strictly positive labour market income in the calendar year.

Figure 7 -- LifePaths Joint Distribution of Work Sojourn Times by Definition of Employment

(insert figure here)

The slopes of the point clouds suggest (reassuringly) that every "solid" year of work (24 hours per day, 365 days per year) is associated with about three years of work as more conventionally defined. However, each solid year of work is also associated with a considerable scatter in the point cloud,

Figure 8



Sample Female LifePaths
Sample Male LifePaths
Cumulative PYs of Non-Market Work
Cumulative PYs of Market Work
Cumulative PYs of Leisure
No Spouse No Children
Spouse No Children
No Spouse Children
Spouse Children

representing the fact that annual dichotomous representations of working time are a considerable homogenization of reality.

Finally, Figure 8 gives another set of views of the LifePaths cohort. This is also a small sub-sample of the cohort simulated. This time, individuals were "checked" every three months during their entire lifetimes. At each "check" time, their cumulative time spent in market work, in non-market work, and in leisure was recorded. The various curves in Figure 8 show individuals' trajectories through the life cycle of time spent in pairs of these activities. For example, the graph in the upper left shows time spent in market work along the horizontal axis, and time spent in non market work along the vertical. In all cases, individuals move from the origin in the south-west toward the north-east.

Comparing the left pair of graphs, men tend to spend less time in non-market work (the slope of their set of curves is lower) than women, while women far more often interrupt their periods of market work and have intervals where they spend most of their time in non-market work (indicated by trajectories that head almost due north). Judging by the typical slopes of the trajectories in the right hand pair of graphs, for every hour of non-market work, men spend about twice as much time in leisure than women.

(In addition, but invisible in black and white versions of the graphs, the trajectories are colour coded to show individuals' demographic status – living with or without a spouse, and with or without children. These show, for example, that the vertical segments for men's life paths in the lower left tend to be associated with .....)

Figure 8 -- LifePaths Sample Cumulative Bivariate Life Paths

(insert figure here)

Validation and Data Quality Concerns

Validating the LifePaths model is fundamentally impossible. The reason, simply, is that its intent is to create an instance of a sample from a hypothetical birth cohort. Thus, no comparison with "reality" is ever possible. However, the synthetic microcosm of individual life paths should, by construction, reproduce the major marginal joint distributions from which it was built. For example, this was the case with labour force participation rates , fertility rates, mortality rates, union formation and dissolution rates, educational enrollment rates, and age/sex-specific distributions of labour market earnings.

During the course of constructing LifePaths, these comparisons have been continually checked. By and large, agreement is good. The main instances of disagreement arise when the underlying data sources are not themselves consistent with each other, for example administrative data on school enrolments and census data on school attendance by children.

Concluding Comments

LifePaths is a richly multivariate longitudinal microsimulation model. It synthesizes birth cohort life cycles, based on samples of hypothetical but realistic individual life histories. It therefore generalizes a variety of life table analyses, including working life tables, and affords a much wider variety of "views" of working time over the life cycle. Given LifePaths explicit microdata foundations, emphasis has been placed on graphs and data visualization in order to display a coherent set of these views.

The results highlight the sensitivity of impressions of work over the life cycle to the precise definition of work time. They also give impressions of the considerable degree of individual heterogeneity, and several perspectives on the significant differences between men and women.

The construction of the LifePaths model and estimation of all the various transition probability functions has been a major exercise. However, future updates and extensions will be easier. Thus, in future, it should be possible to begin constructing a sequence of LifePaths period birth cohorts, analogous to

the working life expectancies for each decade shown in Table 1. Then trends in the patterns shown in the various graphs can be displayed.

In addition, with further empirical work and projections for the various transition probability functions. LifePaths can be extended to produce generalizations of cohort life tables, and overlapping birth cohorts evolving in real calendar time. Such a simulation capacity would allow extrapolation of existing trends and patterns, and derivation of views like those shown. Moreover, it would allow "what if" scenarios to be constructed and viewed. Such activity-based longitudinal microsimulation could prove useful for a range of policy issues, ranging from labour markets to institutionalization of the elderly to leisure time, where the unifying feature is the importance of how individuals allocate their time.

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APPENDIX -- Microsimulation of Patterns of Time Use

This appendix provides further detail on the methods by which the time use data collected in the 1992 General Social Survey (GSS, Statistics Canada, 199X) were imputed to the individual histories simulated by LifePaths. These GSS data by their nature provide a cross-section of the time use patterns of Canadians in 1992, and cannot directly provide a view of time use over the life course. LifePaths simulations therefore require an imputation of time use patterns over the life times of synthetic individuals.

For these purposes, GSS time uses were partitioned into 17 mutually exclusive activity types:

employment	self employment	commuting
family care	domestic work	volunteer work
adult education	formal education	sleep/nap
shopping	personal care	social leisure
active leisure	serviced leisure (movies etc.)	passive leisure (tv etc.)
reading	other	

Given this classification of activities, the GSS data set can be thought of as an array of 8815 rows (each row corresponding to a respondent with a complete set of responses) and 17 columns. About 60% of all the cells of this array indicate zero reported time use. However, these zeros should not necessarily be interpreted as representing a complete absence of time engaged in a given activity, for two reasons:

- reported time use activities are "main" activities that partition the day into mutually exclusive periods; joint time use such as reading for leisure while traveling to work on the bus is precluded; and

- there is evidence of substantial rounding in the responses. For example, 32% of reported durations of sleep are even multiples of an hour, while 16% are even multiples of half an hour .

Moreover, it is important to distinguish between two types of zero in this overall array:

- Response Zeros -- zeros that represent activities that are engaged in with small probability, for short intervals or that are unlikely to be a main activity. The expected values of such zeros in the observed GSS data should be represented as small positive quantities.

- Structural Zeros -- zero time spent in an activity that is likely to be a main activity, where such a zero is reasonable in relation to the stage in the life cycle. For example, retirement usually implies no paid work. Such zeros should be modeled as zeros – they are essentially impossible events.

Zero time spent in an activity was operationally identified as a structural zero for:

- employment or self-employment -- if the main activity in the previous 7 days was either retirement, long term illness, maternity/paternity leave, or other non-work if no work was reported in the previous year

- commuting -- where both employment and self-employment are structural zeros.

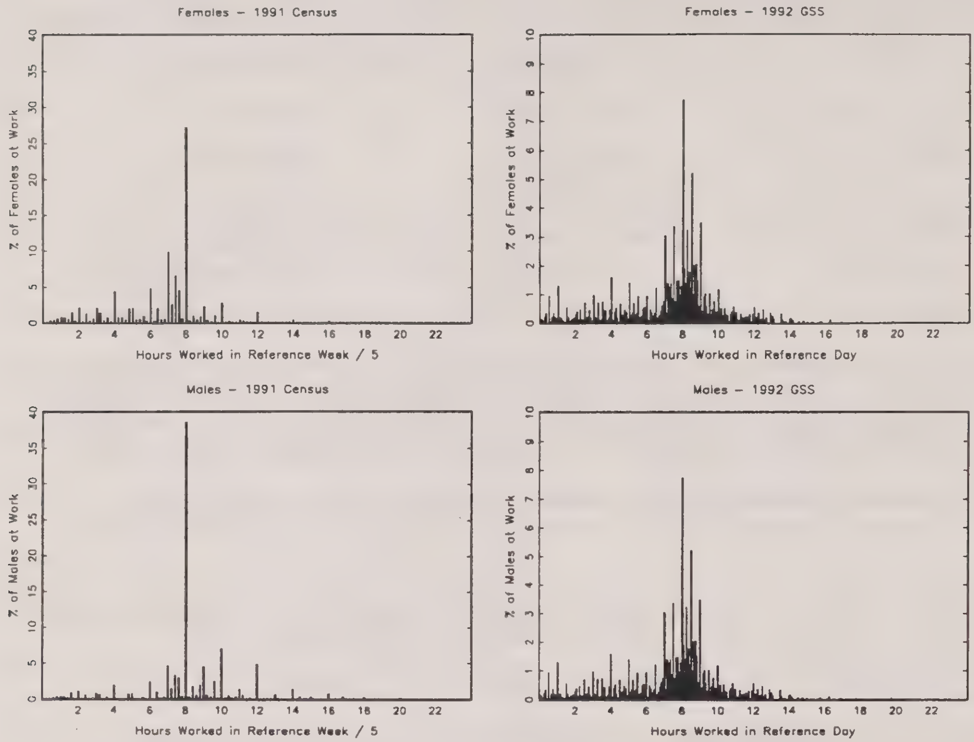
- formal education -- if employment and/or self-employment are non-zero.

- family care -- if no spouse or child were present in the household.

About 12,000 structural zeros were identified by these definitions, representing about 13% of the zeros in the data array.

Background on the Character of the GSS Time Use Data

The GSS time use data is characterized by a higher degree of heterogeneity than is typically observed from other data sources. Figure A1 compares 1992 GSS data on hours of work in the reference day to 1991 Census data on hours of work (employed and self-employed) in the reference week (the latter hours divided by 5 for comparability).

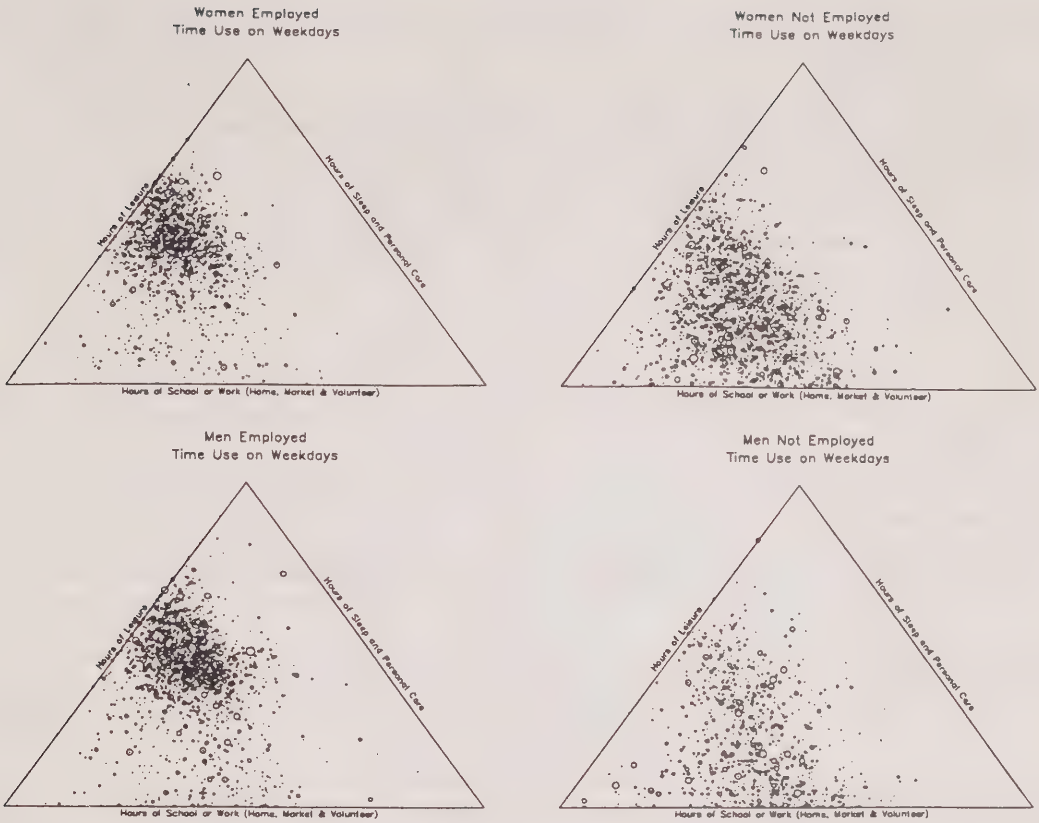


Appendix Figure A1: Distributions of Hours of Work, 1991 Census and 1992 GSS

In common with similar survey data on hours worked in a week, the Census data exhibit a marked spike corresponding to exactly 40 hours (nearly 40% of responses for males and about 25% for females). In contrast, the GSS reveals no more than about 8% of exactly 8 hour day responses. As such, the GSS data are putatively the more accurate representation of the heterogeneity in individual time use patterns, and indicate significant rounding bias in the reported census data.

Figure YY displays selected patterns of time use in the form of triangular scatter plots. These plots represent a three-way partitioning of the hours in a day by the distances at 90 degrees from each edge of the triangle. Each circle in the plot represents a single GSS response, with the area of the circle being proportionate to the survey weight associated with the response. The distances from the edges of the triangles represent, respectively, (i) hours spent in work of all types (market, domestic (including family care) & volunteer), (ii) hours spent in leisure and (iii) hours of personal care and sleep.

The scatter of observations displayed in Figure A2 reinforces the impression that the GSS data exhibit a high degree of heterogeneity, even in respect of a simple three-way partition of activity types. Differences between the employed and not-employed are characterized as much by increased dispersion as by inevitable differences in the location of the scatter of observations.



Appendix Figure A2: Selected Patterns of Time Use - 1992 GSS

In summary, the GSS time use data comprises both highly varied observations of time use and a preponderance of zeros reflecting patterns of activity choice and intensity. As a result, these data cannot be summarized parsimoniously, so a more involved imputation method has been developed.

Time Use Imputation Equations

A sequence of three equations was used to impute daily time use patterns to the individual trajectories simulated by LifePaths. In all cases, k indexes the 17 activities, and i the individual respondents to the GSS. These equations were estimated from the GSS 8815 by 17 array.

The first logistic equation describes the patterns of occurrence of structural zeros.

$$(1) \qquad E(\, ZERO_{ik}\,) \approx (\, 1 + \exp[\, - X^{*}_{ij}\, \beta^{*}_{jk}\,]\,)^{-1}$$

The second set of 17 log-linear equations provide estimates patterns of time use conditional on the structural zeros estimated in the first equation.

$$(2) \qquad E(\, GSS_{ik} \mid \; ZERO_{ik} = 0) \approx \exp[\, X_{ij}\, \beta_{jk} \; + \beta_i\,]$$

where GSS_{ik} = the proportion of daily time spent by individual i in activity k. A special feature of this second set of equations is the term β_i representing a constant term for every respondent in the sample. These individual level constants represent a constraint on each individual's predicted time use pattern (i.e., it must

sum to 100% of 24 hours). The individual level constants may also be interpreted as reflecting random factors at the individual level that can be further modeled.

The third set of equations then captures patterns in individual variability of time spent in each activity. Residual variances are defined in terms of differences in square root proportions, rather than the more usual log differences, to avoid problems with response and structural zeros (since the log residual ($\ln(0) - \ln(\mu)$) is undefined). As well as being defined for zeros, the vector distance measure expressed in terms of differences in square roots is a true distance (i.e., satisfying $d(x,y) \geq 0$, $d(x,y) = d(y,x)$ and $d(x,y) + d(y,z) \geq d(x,z)$) and is unique in that respect among common distance measures on the unit simplex.

$$(3) \qquad SD_i = \sqrt{(\Sigma (\sqrt{GSS_{ik}} - \sqrt{\exp[X_{ij} \beta_{jk} + \beta_i]})^2)}$$

$$\approx \exp[X_{ij} \theta_{jk} + \sigma\varepsilon_i], \qquad \text{where } \varepsilon \sim \text{Normal}(0, \sigma^2)$$

In other words, it is being assumed that the standard deviations (SD_i) of time use proportions are log normal, though with means depending on X_{ij}.

Estimation for equations (1) and (2) was carried-out by iterative proportionate adjustment, while equation (3) was estimated by least squares.

The choice of predictor variables in each of the equations was constrained by what was available both on the GSS and in the LifePaths model. The following variables were used:

Predictor Variables	**Definitions**
reference day	Sunday, ... , Saturday
sex	Male, Female
age group	15-17, 18-19, 20-24, 25-29, ... ,65-69, 70+
marital situation	married or CLU (spouse not working last week), married or CLU (spouse worked last week), never married, widowed, divorced or separated
children	no children at home, all children at home aged 5+, one or more children at home aged <5
education attainment	less than secondary school, secondary school only, at least some post-secondary
respondent's work	mainly a full time student last week, working last week, not working and not mainly a full time student last week
response rounding	0 responses in multiples of 1/2 hour, 1 response in a multiple of 1/2 hour, 2 responses in multiples of 1/2 hour, 3+ responses in multiples of 1/2 hour

An evaluation of the fit of these equations is difficult both because of the zeros in the data, and because the statistical properties of entries in time use diaries are difficult to specify. The following evaluation measures were calculated by analogy to statistical models of count data and should be taken as merely suggestive of the explanatory power of each variable.

Reduction in Deviance due to addition of independent variables	Structural Zero Model (Equation 1)		Time Use Model (Equation 2)	
Variable	Deviance	# Fitted Parameters	Deviance	# Fitted Parameters
reference day	17.1 ns	42	4645 **	119
sex	875.0 **	12	923.1 **	34
age group	4611.8 **	78	1241 **	221
marital situation	29.1 ns	24	198.5 **	68
children	230.5 **	18	1325 **	51
education attainment	327.9 **	18	389.7 **	51
work	--	--	4355 **	51
rounding	--	--	48.55 ns	68

Note: ** denotes significance at 5%; ns denotes not significant at 5%

Imputation Algorithm

Finally, given the estimated set of equations, imputation of the 17 element time-use activity vectors was based on an algorithm that started with annual features, and then successively expanded to the imputation to weekly and ultimately daily features. For each individual life cycle history simulated by LifePaths, and for each year, the following procedure was implemented:

Starting at the annual level,

- choose ZERO day - based on a uniform random number ranging from 1 to 365. Note that the interval between successive ZERO days will range from 1 to 729 days.

- on ZERO day, it is decided whether not a structural zero will be imputed to market work, commuting, formal learning and/or care for family members for the next "year" (actually until the next ZERO day), based on probabilities determined from the logistic regression equation (1) estimated from GSS data.

Given these annual level imputations, the process next focuses on a week:

- choose a random REF day - based on a uniform random number ranging from 1 to 7. Note that the interval between successive REF days will range from 1 to 13 days.

- on REF day each week, one of the actual 8815 empirical residual vectors RESID is chosen at random. The residual vectors are in standardized form:

  RESID = [(sqrt (GSS) - sqrt (fitted from equation 2)] / SD.

- also on REF day, a random heterogeneity term ($\sigma\varepsilon$) is generated from the log-normal distribution represented by equation (3).

Finally, the imputation algorithm determines a set of daily activity patterns for all 365 days of the year (actually, all the days until the next ZERO day):

- each day, the appropriate average time use vector (AVG) is determined -- corresponding to the day of week, sex, age, marital situation, presence of children, employment/schooling and education

attainment – by applying equation (2) to the LifePaths variables pertaining to that day. A corresponding calculation, based on equation (3), provides the heterogeneity term (SD) appropriate to the day of the week, etc. and to $\sigma\varepsilon$.

- subsequently, the average, residual and heterogeneity terms are combined:

  sqrt (AVG) + RESID*SD

  The added variability due to the RESID and SD terms preserve correlations among time use activities and account for inter-individual variation. By varying RESID and SD only on a weekly basis, some (possibly spurious) correlation is induced between days of a given week.

- impossible time uses are set to zero -- for example:

age < 6:	pre-school: domestic work, formal learning & reading;
age < 12:	family care;
age < 15:	market work, commuting & adult education;
institutional:	market work, commuting, family care, domestic work, & volunteer work

  Likewise, structural zeros as prescribed above are set if necessary conditions are still met:

  - employment time use = 0, if no work simulated for the previous 12 months
  - self-employment time use = 0, if no work simulated for the previous 12 months
  - commuting time use = 0, if no work simulated for the previous 12 months
  - formal learning time use = 0, if currently employed
  - family care time use = 0, if no spouse & no children are present at home

- finally, negative [sqrt (AVG) + RESID*SD] combinations are set to zero, with the remaining values transformed and scaled to sum to 1.0.

The algorithm thus provides simulated time use proportions that will approximately reproduce time use averages, variances and covariances as observed in the GSS data

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Supply of Hours Per Day and Days Per Week: Evidence from the Canadian Labour Market Activity Survey (LMAS)

Richard Mueller
University of Texas at Austin

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Statistics Canada, and the
W.E. Upjohn Institute for Employment Research.

Supply of Hours per Day and Days per Week: Evidence from the Canadian Labour Market Activity Survey

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May 1996

Abstract

The common measures of labour supply used in the literature are hours per week and weeks per year. There is reason to believe, however, that the use of such labour supply aggregates mask important details regarding the combinations of days and hours actually worked and desired by employees. Furthermore, it is well-known that fixed costs of employment can effectively prohibit labour market entry. Likewise, hourly and daily fixed costs of employment can theoretically alter the labour supply choices of individuals in these two dimensions. The LMAS contains data which allow us to undertake a more comprehensive look at the labour supply decisions of individuals in terms of both days per week and hours per day. Our results suggest that flexibility in days and hours are important, but also that demand-side rigidities exist in the Canadian labour market. Our results are also supportive of the hypothesis that the daily fixed costs of employment are relatively higher than the hourly costs.

Paper to be presented at the Canadian Employment Research Forum (CERF) Conference on the Changes in Working Time in Canada and the United States, June 13-15, 1996, Ottawa, Ontario.

Supply of Hours per Day and Days per Week: Evidence from the Canadian Labour Market Activity Survey

I. Introduction

A significant amount of research has been conducted on the determinants of the supply of labour. In these studies the quantity of labour supplied is usually counted as the number of hours supplied per year or per week, largely owing to the fact that most labour force surveys do not disaggregate work hours more finely than the weekly level.[1] The number of hours per week, of course, is simply the product of days worked per week and hours worked per day, assuming both of these remain constant throughout the week. Still, there is reason to believe that different workers desire to work a different number of days per week and hours per day even though the number of hours per week that each wishes to work may remain constant. For this reason, the use of weekly, monthly or yearly hourly aggregates may mask a number of important and interesting characteristics of labour supply. For one, the fixed costs of supplying labour may differ depending on the unit of analysis. It is well-known that daily costs of work in terms of child-care expenses, commuting costs, etc. may affect daily labour supply decisions. There may also exist hourly fixed costs of employment which could likewise influence this dimension of labour supply. Furthermore, employer constraints on the hours and days that one is able to work could limit the optimal days/hours combination from the employee's point of view. To the extent that these constraints exist, optimal days/hours pairs may only become manifested as employees actually change jobs and sort into new positions with this combination.

This paper will investigate in some detail the days per week and hours per day decisions of workers. The use of a unique data set allows us to decompose the usual weekly hours aggregate into daily hours and weekly days. The relevant literature will be discussed in the next section. Section III presents that data that will be used in subsequent analyses along with some preliminary results. A simple econometric model of supply of hours and days is the topic of Section IV. This largely serves as a check on the data and will allow us to investigate further some of the pertinent determinants of the hours/days labour supply decision. Insofar as job change behavior is related to a less than optimal combination of

[1] Hamermesh (1996) notes that most labour force surveys ask the question, "How many hours did you work last week?"

hours and days, Section V presents and estimates a simple model of job change behavior. A more detailed look at the actual hours and days changes of job changers is the focus of Section VI. The sample is limited to include only those workers who actually change jobs. We assume that changes in hours/days combinations will differ depending on the circumstances under which the job change occurred. Thus, voluntary and involuntary job changers are looked at separately. Furthermore, if workers desire to work additional hours, but are constrained from doing so, we can reasonably assume that job change could be the result as workers sort into those jobs with a more desired combination of days and hours. The final section concludes and offers some areas for potentially fruitful future research.

II. Previous Research

Previous research has addressed a variety of related time aggregation problems. Hanoch (1980a,b) distinguished between the hours per week and weeks per year decision in a reservation wage model of female labour supply. Blank (1988) built on this model to allow for simultaneity of the hours and weeks decision. She also allowed for discontinuities in the labour supply decision that can occur as a result of fixed costs of employment or if workers are constrained by firms who will only allow a minimum number of hours per week and/or weeks per year. She concluded that the evidence provides support for the theory that female heads face either significant fixed costs of employment or structural barriers to low levels of yearly weeks or weekly hours of work.[2] Also, the decisions on hours of work per week and weeks of work per year are made independently, but simultaneously. Thus, the use of aggregated annual hours in many analyses may be inappropriate since the variable lacks the necessary detail.

The recent literature on Canadian labour supply has also analyzed the changes in hours worked over time, usually at the aggregate of annual or weekly hours worked, and often in the context of an explanation for earnings polarization. Morissette, Myles and Picot (1994) have shown that the 1980s experienced a widening in the distribution of annual hours worked between workers. Morissette and Sunter (1994) and Morissette (1995) showed that the distribution of weekly hours also widened during the

[2] Cogan (1980, 1981), Hanoch (1980b) and Hausman (1980) have all shown that higher fixed costs of entering the labour force result in lower participation rates. The argument is that the hourly wage must be at least as great as the average hourly fixed costs of working for the individual to even consider entering the labour force. Expenses such as child care, transportation and clothing represent significant fixed costs and, since average fixed costs decline over the number of hours worked, a person must be able to work a minimum number of hours to recoup these costs.

1980s; fewer individuals worked 35-40 hour weeks, while the fractions working either shorter or longer hours rose. Other research has addressed the increase in multiple-job holdings and part-time work (Krahn 1995; Logan 1994; Pold 1994, 1995). One of the lessons of this research is that aggregate measures of employment, such as annual hours worked, tend to obscure the fundamental underlying changes in the labour market over time, even though aggregate mean changes may show only modest changes.

Just as aggregated annual hours hide important details, it is plausible that weekly hours may also be an inappropriate unit of analysis since the choice of days per week and hours per day could be related and simultaneous decisions on the part of workers. In addition, there can be fixed costs per day of work and even fixed costs per hour of work. Aggregation of work hours into hours per year and hours per week does not allow us to investigate the complexity of the workers' decisions.

The costs of child care are frequently used in estimating the probability of female labour force participation. Many of these studies are nicely summarized in Cleveland, et al. (1996). Blau and Robins (1988) and Ribar (1992), for example, have found that child care costs have a negative effect on female labour force participation decisions. Cleveland, et al. (1996) arrive at similar results using Canadian data. Generally, such empirical work is supportive of economic theory in that higher costs of child care lead to lower female labour force participation rates. What these studies have in common is their use of female participation as the dimension of labour supply analyzed. One exception to this is the study by Michalopoulos, et al. (1992) which used hours supplied as the unit of analysis. They discovered that reduced child care tax credits resulted in a reduction in hours for women currently employed. These studies, however, did not address the impact of child care costs on the supply of hours and days. In another example of the importance of fixed costs on the labour supply decision, Zax and Kain (1991) showed that increases in commuting times generally increased the probability of employee quits.

Aside from the fixed costs of employment, employer inflexibility could be that factor that limits the days and hours and people are able to work, despite their preferences. Altonji and Paxson (1992) showed that married women who change jobs exhibited more of a change in weekly and yearly hours compared to those who did not change jobs. They attributed this to employers restricting hours choices which necessitated job change to attain the desired number of hours. Rettenmaier (1996) discovered that

individuals who prefer low or high hours of work were more likely to be self-employed since they had a lower probability of finding these hours in paid jobs. In a related paper, Kahn and Lang (1995) found that over half of Canadians in 1985 were dissatisfied with the number of weekly hours they usually worked. Of these, about two-thirds expressed the desire for more weekly hours, not fewer. Of course, an increase in weekly hours can come from increasing days per week or weeks per day or both. If high fixed costs per day of work are high relative to fixed hourly costs, we would find that these workers desired to put in more hours per day in increasing their hours per week. If the hourly costs of work are higher, we would expect the opposite, assuming that their are no employer-imposed constraints on the availability of hours and days.

There is in fact some evidence suggesting that that the aggregation of days and hours into weekly hours results may result in poor labour supply estimates. Hamermesh (1996) provided estimates of the reduced-form correlates of days and daily hours in the absence of a formal model. He concluded that we cannot treat weekly hours as a reliable unit of analysis since daily hours and days per week both vary. He found that daily hours, in both the U.S. and Germany, tended to vary more than days per week in response to various exogenous shocks such as changes in the unemployment rate. This implies that the cost of changing days per week is higher than the cost of changing hours per day.

We want to dissect the weekly hours decision faced by workers. The first step will be to model this days and hours decision. If there are significant fixed costs to the number of hours per week and the number of weeks per year worked, fixed costs in daily and hourly terms may also be important in determining the combination of hours per day and days per week.. The daily act of preparing for work and commuting to and from the work site results in substantial sunk costs which are borne by workers. In other words, are the hours per day and days per week decision joint? Are the determinants of the two the same? Are there significant fixed costs per day or per hour of work which prevent people from seeking jobs? Or is it employers who constrain the available set of hours and days that employees may choose?

III. Data

The 1990 Canadian Labour Market Activity Survey (LMAS) of 1990 will be utilized in the empirical part of the paper. The LMAS is a unique data set since it includes variables for days per week

and hours per day usually worked, variables which are not normally found in labour force surveys.[3] Data on up to five jobs held by each individual in 1990 are also included. This will ultimately allow us to make inferences about the motives behind the behavior of job changers. The data set also includes other useful variables for the reason the respondent left the job and the number of additional monthly hours the respondent desired to work. This information will be useful in deducing whether it is fixed costs that result in various hours/days combinations, or it is rigidities in the labour market which do not make the desired combinations of hours/days available to employees.

The sample includes those between the ages of 17 and 64 who lived throughout the country, with the exception of the Yukon and Northwest Territories. Those who did not hold any job in 1990 were eliminated from the sample as were those did not work at a paid job (i.e., the self-employed) or those who attended school full-time at any time during the year.[4] Those who held more than two jobs in 1990 were eliminated. To avoid job overlap (for example, due to moonlighting), those who started a second job in a week preceding the completion of the first job were dropped from the sample. Also excluded were respondents who claimed to work more than 18 hours per day or earn less that $1.00 per hour at either job. Satisfying these criteria were 16,820 males and 14,635 females. The sample is further disaggregated into job stayers (14,577 males and 13,245 females) and job changers who moved from one paid job to another paid job (1,563 males and 1,318 females).[5]

An initial look at the data reveals that hours of work tend to be more flexible than days of work. Table 1 gives the joint distribution of hours and days for male and female workers. We define the standard workday to be in the 7.5 to 8.5 hour range and the standard workweek to be five days. For all male workers, 78 per cent normally worked the standard five-day workweek. Only 64 per cent of male workers worked the standard workday. As expected, female workers show greater diversity in their usual

[3] Specifically, the questions asked were: (1) How many weeks per month did [the subject] usually work at this job? (2) In those weeks, how many paid days per week did he/she usually work? (3) On those days, how many paid hours per day did he/she usually work?
[4] In Table 1, the sample is broadened to include the self-employed, but only where appropriate data is available. The LMAS divides self-employed workers into four classes: those in businesses that are incorporated and not incorporated, both with and without paid help. Businesses not incorporated with no paid help comprise by far the largest group of self-employed workers (over 50 (60) per cent of male (female) self-employed workers). Unfortunately, the LMAS does not include data on hours and days for this group. For this reason, the analysis past Table 1 will be limited to paid workers only.
[5] 140 males and 72 females who held paid jobs preceding self-employment were removed from the sample.

Table 1: Joint Distribution of Hours per Day and Days per Week, All Workers, Paid and Self-Employed Workers, Males and Females

(percentages)

Males

	All Workers (n = 18328)				Paid Workers (n = 16280)				Self-Employed (n = 2048)			
	Days/Week				Days/Week				Days/Week			
Hours/Day	1-4	5	6-7	Total	1-4	5	6-7	Total	1-4	5	6-7	Total
<4.0	0.18	0.23	0.09	0.50	0.19	0.18	0.07	0.44	0.15	0.63	0.24	1.02
4.0 - 5.9	0.51	0.74	0.20	1.45	0.51	0.76	0.15	1.42	0.54	0.59	0.54	1.67
6.0 - 7.4	0.69	4.44	0.62	5.75	0.73	4.70	0.53	5.96	0.34	2.34	1.32	4.00
7.5 - 8.5	1.79	58.55	3.82	64.16	1.83	63.36	2.99	68.18	1.56	20.31	10.45	32.32
8.6 - 9.9	0.32	5.36	1.53	7.21	0.32	5.29	0.88	6.49	0.24	5.96	6.64	12.84
>9.9	4.06	8.56	8.32	20.94	4.44	7.75	5.33	17.52	1.07	14.94	32.13	48.14
Total	7.55	77.88	14.58	100.00	8.02	82.04	9.95	100.00	3.90	44.77	51.32	100.00

Females

	All Workers (n = 15263)				Paid Workers (n = 14635)				Self-Employed (n = 628)			
	Days/Week				Days/Week				Days/Week			
Hours/Day	1-4	5	6-7	Total	1-4	5	6-7	Total	1-4	5	6-7	Total
<4.0	1.13	1.47	0.33	2.93	1.11	1.42	0.23	2.76	1.75	2.55	2.71	7.01
4.0 - 5.9	3.97	4.48	0.56	9.01	4.00	4.48	0.50	8.98	3.34	4.46	1.91	9.71
6.0 - 7.4	5.37	15.20	0.89	21.46	5.46	15.54	0.77	21.77	3.35	7.32	3.66	14.33
7.5 - 8.5	8.25	46.28	2.44	56.97	8.41	47.47	2.15	58.03	4.29	18.63	9.39	32.31
8.6 - 9.9	0.39	2.10	0.55	3.04	0.38	2.00	0.42	2.80	0.64	4.46	3.50	8.60
>9.9	2.37	2.14	2.06	6.57	2.44	1.98	1.23	5.65	0.80	5.89	21.34	28.03
Total	21.48	71.67	6.83	100.00	21.80	72.89	5.30	100.00	14.17	43.31	42.51	100.00

Note: Totals may not add due to rounding error.

hours and days as 72 per cent worked the standard five-day week and 57 per cent worked the "normal" workday.

Since we consider the self-employed as being somewhat less constrained by the days and hours restrictions of paid employees, we expect this group of workers to exhibit greater variance in their observed hours and days. Further breaking down the sample into paid workers and self-employed workers does in fact reveal this; paid workers tend to work more standard days and hours compared to those who are self-employed. Some 82 per cent of paid males worked a five-day week in 1990, compared to only 45 per cent of self-employed males. In fact, over 51 per cent of self-employed males worked six or seven-day weeks. Usual work hours were also more standardized for paid workers with 68 per cent working normal hours. By contrast, only 32 per cent of self-employed males worked between 7.5 and 8.5 hours per day, with 48 per cent working ten hours per day or more. Both the hours and days distributions are more heavily weighted at the top for self-employed males. One interesting result is that over four per cent of paid workers work at least 10 hours per day but less than five days per week. This suggests that some workers are in fact able to work longer hours and fewer days within a standard-length workweek.

Women generally show more flexibility in their hours and days combinations compared to men. For paid women, 73 per cent worked a standard five-day week and 58 per cent worked the standard workday, about 10 percentage points lower than the equivalent values for males. Paid females are also much more likely to work shorter hours and days than their male counterparts and less likely to work longer days and hours. As with the case of males, self-employed females showed much more variation in their hours and days; more were likely to work larger numbers of hours and days compared to female paid workers. They were also more concentrated in the lower tail of the hours per day distribution. Compared to self-employed males, females were more likely to work both shorter hours and days.

These patterns are generally consistent with those obtained by Hamermesh (1996) in his comparison of U.S. and German labour supply. In the U.S., about three-fourths of paid male workers work a standard five-day workweek, compared to 89 per cent of German males. The distribution of days is heavier in both tails for American workers. The days distribution of Canadian males lies between that of the Americans and Germans. The data also show that Canadian males are similar to both American

and German males in working a standard-length workday, although the data are not completely comparable.[6] There are, however, differences in the distribution of hours between the countries. The distribution for North American males is skewed to the right as workers tend to work longer workdays compared to the Germans. Both Canadian and American males are also less likely to work fewer hours per day.

For female paid employees, 74 per cent of Americans and 82 per cent of Germans worked a standard five-day workweek. The proportion of Canadian women working five days per week is far below that of German women and slightly below that of American women. The days distribution is skewed left for Canadian women; they are more likely to work less than five days per week and less likely to work six or seven days per week than both their German and American counterparts. As far as hours are concerned, both Canadian and American women are more likely to work a standard workday compared to German women. The hours distribution for German women, by contrast, has much more weight at the tails than that of the either Canadian or American women.

Finally, in all three countries, self-employed workers of both genders work both longer hours and days compared to paid employees, with the bulk of this the result of an increase in days worked.

IV. A Simple Model of Labour Supply

Loosely extending a standard labour supply model such as the one found in Blank (1988), we can model the days and hours labour supply decision and then estimate the model. Each individual is assumed to maximize his/her utility which is a function of the level of consumption and the amount of leisure consumed. Formally, the basic model can be written as

$$(1) \qquad \max_{C,D_l,H_l} U(C, D_l, H_l)$$

subject to

$$C = Y + D_w \cdot H_w \cdot W$$

$$D_l = D - D_w$$

$$H_l = D_w \cdot (H - H_w),$$

[6] Direct comparability is a problem because of differing definitions of workday length. Hamermesh uses an eight-hour day as a standard workday, whereas we define the range 7.5 to 8.5 hours to be standard.

where C is weekly consumption and is simply the amount of endogenous income available (Y) plus the amount of labour income earned per week. The latter is simply the usual number of days worked per week (D_w) times the usual number of hours worked per day (H_w) times the usual hourly wage (W). Leisure is divided into days per week (D_l) of leisure which is simply the number of days per week (D) less the number of days per week worked (D_w), and hours of leisure (H_l) which is the weekly amount of leisure consumed on days worked and is simply the number of days per week worked (D_w) times the number of hours on these days not at work ($H - H_w$). Since hours and days of leisure may be qualitatively different for individuals, they enter the utility functions separately.

We know that solving the above problem yields Marshallian demand functions for hours of leisure and days of leisure which can be transposed into demand function for days per week of work and hours per day of work. In other words, we can solve for

(2a) $$D_w = D_w(Y, W, \delta)$$

(2b) $$H_w = H_w(Y, W, \delta),$$

where δ is a vector of demographic and job-related variables that we assume will effect demand for hours and days of work.

Although the above model allows us a simple means of testing the effect of various variables on the demand for days and hours of work, it is an oversimplification of a complex individual choice model. It implicitly assumes that fixed costs of employment (both hourly and daily) are zero and thus have no impact on the labour supply decision. To make the model more realistic, we need to add fixed costs of employment for both days of work and hours of work. For example, the simple act of preparing for and commuting to work involves costs which are borne daily, regardless of the amount of time spent on the job. Other costs, however, are a function of the amount of time per day spent on the job. Costs such as day care and parking may be on an hourly basis.

In order to account for these fixed costs, model (1) above can be modified. If we assume that α represents the fixed costs per day of work, and μ are the fixed costs per hour of work, model (1) becomes

(3) $$\max_{C, D_l, H_l} U(C, D_l, H_l)$$

subject to

$$C = Y - \alpha D_w + D_w \cdot H_w \cdot W(1-\mu)$$

$$D_l = D - D_w$$

$$H_l = D_w \cdot (H - H_w).$$

Again, we are able to solve the above problem and ultimately arrive at demand functions for days per week of work and hours per day of work which take into account these fixed costs of work. In particular, we solve for $D_w = D_w(Y, W, \delta, \alpha, \mu)$ and $H_w = H_w(Y, W, \delta, \alpha, \mu)$ which now take into account the hourly and daily fixed costs of work. If we assume that leisure (in either days or hours) is a normal good, and that the substitution effect is greater than the income effect, then an increase in the fixed costs of days or hours should increase the amount of leisure taken. Obversely, the number of hours and days of work supplied should decrease as the direct costs of each increase. Thus, we assume that $\partial D_w / \partial \alpha < 0$ and $\partial H_w / \partial u < 0$. Furthermore, if we assume that hours and days are substitutes, the cross partial derivatives will both be positive. In other words, $\partial D_w / \partial u > 0$ and $\partial H_w / \partial \alpha > 0$ says that as the fixed cost per hour (day) of work increases, the individual will increase his/her supply of days (hours) since the opportunity cost of doing so is now relatively less expensive.

To operationalize the model into days and hours, we assume a linear approximation of the relationship between the supply of labour and its determinants. Thus, model (3) becomes:

(4a) $$D_w^* = X_1\beta_1 + \varepsilon_1$$

(4b) $$H_w^* = X_2\beta_2 + \varepsilon_2,$$

where X_1 and X_2 are vectors of individual and job characteristics that determine the number of days and hours supplied, β_1 and β_2 are the vector of coefficients, and ε_1 and ε_2 are the usual white noise error terms. Of course, D_w^* and H_w^* are only observed if the respondent is actually a labour force participant; they are written in natural logarithms.

Equations (4), however, are limited since they implicitly assume that the hours and days decisions are separable. They also implicitly assume that there are no discontinuities in labour supply

choices. It is well-established that discontinuities do in fact arise from the fixed costs of work (hourly, daily, weekly, etc.) as well as employer-imposed constraints which may limit the maximum or minimum hours that a person is able to work, thus narrowing the distribution of the choice set of the worker. Still, it provides a starting point to analyze the determinants of hours and days of work. From estimation of equations (4), certain implications about daily and hourly costs of employment can be ascertained.

Table 2 presents summary statistics for both males and females.[7] The entire sample is also disaggregated into job stayers and job changers. These raw data on job changers are generally consistent with those of previous studies.[8] Men tended to work both more hours per day and more days per week, on average, compared to women. For both genders, job stayers worked both fewer days and hours than those who ultimately changed jobs. Males were slightly more likely to change jobs than females in 1990, 9.6 per cent versus 9.0 per cent.[9] Male job changers, however, left their first jobs voluntarily 64 per cent of the time compared to a voluntary separation rate of almost 76 per cent for females.[10] Also of note is the proportion of stayers and changers who desired extra monthly hours at their first jobs; for both genders a much higher proportion of changers responded that they desired extra monthly hours at their jobs. This statistic is of note because the desire for more hours may provide the impetus for workers to change jobs in search of those extra hours. Whether the new jobs of changers are more hours- or days-intensive than their previous jobs also may give us insights into the fixed costs of hours and days. The results in Table 2, however, do not provide much guidance; male job changers work only marginally more hours and days in their new jobs, while females work marginally more hours and marginally fewer days.

[7] Details on the industry and occupational group categories used in Table 2 can be found in Abbott and Beach (1994).

[8] These results for job changers are generally consistent with those obtained using Canadian data by Kidd (1994). Kidd, however, provides more insight into the separation decision by disaggregating job movers into quitters, lay-offs and others.

[9] These numbers are arrived at by dividing the number of job changers by the number in the full sample.

[10] Those respondents who changed jobs because of a labour dispute, a seasonal or permanent layoff, a company moving or going out of business (i.e., a plant closure) or a dismissal are considered involuntary job movers. Those who changed jobs as a result of an illness or disability, personal or family responsibilities, to move to a new residence or return to school, a retirement, a new job or a because of a variety of poor working conditions are all considered voluntary movers. Similar observations have been made using U.S. and U.K. data. For the U.S., both Viscusi (1980) and Blau and Khan (1981b) concluded that the probability of job quit was higher among females than males when no controls were included in the analysis (but that gender differences did tend to disappear once controls are added). Conversely, male U.S. workers had a higher probability of being laid off according to Blau and Kahn (1981a). Shorey (1983) arrived at similar conclusions using data from the U.K. More recent U.S. evidence has been mixed. Donohue (1988) found higher quit rates among women at their first job following formal schooling. Lynch (1992) discovered no differences by gender in separation behavior from the first employer. Light and Ureta (1992), by contrast, concluded that women were less likely to quite after controlling for unobserved heterogeneity. Using personnel records from a large firm, Sicherman (1996) found that women had higher initial quit rates than men, but that these tended to converge with time. Women, however, displayed a higher propensity to quit for non-market related reasons such as household duties or an illness in the family.

Table 2: Sample Mean Personal and Job Characteristics of Male and Female Paid Workers, Job Changers and Job Stayers, 1990
(Percentages unless otherwise noted)

	Males			Females		
	Full Sample	Job Stayers	Job Changers	Full Sample	Job Stayers	Job Changers
Usual Work Schedule						
Hours per day - job 1	8.448	8.435	8.556	7.398	7.387	7.516
Hours per day - job 2	N/A	N/A	8.597	N/A	N/A	7.540
Days per week - job 1	5.012	5.011	5.019	4.625	4.617	4.712
Days per week - job 2	N/A	N/A	5.026	N/A	N/A	4.675
Voluntarily left job 1	N/A	N/A	0.640	N/A	N/A	0.757
Extra monthly hours desired at job 1	0.098	0.092	0.147	0.115	0.108	0.181
Personal Characteristics						
Age						
17-19 years	0.017	0.014	0.054	0.012	0.010	0.032
20-24 years	0.090	0.081	0.177	0.088	0.077	0.193
25-34 years	0.303	0.294	0.386	0.324	0.315	0.407
35-44 years	0.295	0.300	0.240	0.306	0.313	0.239
45-54 years	0.187	0.196	0.106	0.188	0.197	0.101
55-64 years	0.107	0.114	0.038	0.082	0.087	0.027
Children						
Number of kids ages 0-2	0.144	0.142	0.150	0.130	0.132	0.110
Number of kids ages 3-5	0.146	0.145	0.152	0.133	0.133	0.132
Number of kids ages 6 and up	0.907	0.914	0.845	0.897	0.902	0.838
Marital Status						
Married	0.748	0.759	0.633	0.745	0.754	0.659
Single	0.204	0.192	0.322	0.157	0.147	0.250
Other	0.048	0.049	0.044	0.098	0.099	0.091
Relationship to Family Head						
Head	0.815	0.825	0.711	0.253	0.249	0.290
Spouse	0.058	0.056	0.075	0.664	0.674	0.562
Other	0.127	0.118	0.214	0.083	0.077	0.148
Education						
Elementary	0.094	0.095	0.088	0.054	0.054	0.047
Some high school	0.224	0.221	0.250	0.180	0.179	0.181
Graduated high school	0.227	0.227	0.230	0.272	0.271	0.285
Some post-secondary	0.093	0.091	0.107	0.099	0.097	0.124
Post-secondary diploma	0.126	0.128	0.109	0.191	0.192	0.175
University degree	0.139	0.142	0.105	0.131	0.134	0.096
Trade	0.097	0.096	0.111	0.075	0.073	0.092
Region						
BC	0.105	0.104	0.115	0.099	0.097	0.113
Prairies	0.269	0.266	0.291	0.289	0.287	0.305
Ontario	0.205	0.208	0.183	0.210	0.210	0.216
Quebec	0.160	0.161	0.152	0.149	0.154	0.105
Atlantic	0.261	0.261	0.259	0.252	0.252	0.260
Mother Tongue						
English	0.722	0.720	0.744	0.738	0.733	0.789
French	0.187	0.187	0.184	0.175	0.179	0.144
Other	0.092	0.093	0.072	0.087	0.089	0.067
Other						
Immigrant	0.097	0.099	0.079	0.093	0.094	0.078
Visible minority	0.032	0.032	0.030	0.034	0.034	0.027
Job Characteristics						
Firm Size						
19 or fewer employees	0.218	0.203	0.345	0.260	0.254	0.309
20-99 employees	0.156	0.151	0.198	0.149	0.149	0.149
100-499 employees	0.122	0.124	0.106	0.126	0.127	0.115
500 or more employees	0.363	0.379	0.220	0.326	0.333	0.263
Don't know	0.141	0.143	0.131	0.139	0.137	0.165

Table 2 continued

Industry Group (LMAS Industry Codes)						
Goods Sector						
Primary (01-08)	0.091	0.089	0.107	0.031	0.031	0.029
Construction (29-30, 52)	0.098	0.089	0.175	0.016	0.015	0.019
Manufacturing (09-28)	0.239	0.244	0.194	0.103	0.102	0.108
Service Sector						
Distributive services (31-35)	0.182	0.187	0.146	0.069	0.069	0.062
Business services (37-39, 44)	0.058	0.057	0.062	0.115	0.112	0.144
Consumer services (36, 43, 45-47)	0.144	0.135	0.214	0.286	0.275	0.386
Education, health and welfare (40-42)	0.095	0.101	0.050	0.303	0.316	0.178
Public administration (48-51)	0.093	0.097	0.052	0.078	0.078	0.074
Occupation Group (LMAS Occupation Codes)						
Managerial and administrative (01-03)	0.133	0.137	0.087	0.104	0.103	0.112
Professional and technical (04-16)	0.128	0.131	0.106	0.225	0.234	0.143
Clerical (17-22)	0.056	0.056	0.061	0.308	0.309	0.309
Sales (23-24)	0.059	0.057	0.077	0.086	0.085	0.098
Service (25-28)	0.084	0.084	0.087	0.167	0.163	0.203
Primary (29-33)	0.064	0.062	0.087	0.018	0.018	0.022
Processing (34-35)	0.063	0.064	0.050	0.034	0.032	0.050
Machining, fabricating, assembling and repairing (36-42)	0.161	0.163	0.141	0.030	0.031	0.029
Construction trades (43-45)	0.124	0.117	0.187	0.004	0.003	0.011
Transport operating and materials handling (46-49)	0.126	0.127	0.116	0.022	0.022	0.024
Other occupations (50)	0.000	0.000	0.001	0.000	0.000	0.000
Other						
Covered by union agreement	0.453	0.476	0.266	0.384	0.402	0.214
Part-time employment (<120 hours per month)	0.043	0.038	0.086	0.246	0.248	0.222
Tenure at job (weeks)	412	445	136	296	315	114
Covered by pension	0.396	0.395	0.409	0.328	0.327	0.336
Number of Observations	16,280	14,577	1,563	14,635	13,245	1,318

Note: Figures may not add to 100 per cent due to rounding error.

The remainder of the summary personal characteristics in Table 2 offers no surprises. The number of children of various ages appears to have little influence on job change behavior. For both genders, age is negatively related to job change behavior, suggesting that employees are quite mobile while they are younger and sort into appropriate jobs as they age. Job changers of both genders, however, are much more likely to be single than those who do not change jobs. Level of education is negatively related to job change.[11]

Certain job characteristics do appear to differ between genders and also be related to job change behavior. Again, these initial results are consistent with previous research. Job changers are more likely to work in smaller firms (99 or fewer employees) than job stayers. This may be the result of increased intra-firm job mobility within larger-sized firms. Union coverage was more prominent among male than female employees, with coverage for job changers of both genders much less likely by a wide margin.[12] Both male and female job changers had fewer weeks of tenure at their first jobs.[13] Also, the incidence of part-time employment is much higher amongst women. All of these results are expected.

The reduced-from estimates of equations (4), with and without industry and occupational controls, are presented in Table 3.[14] At the bottom of the table, the results from Breusch-Pagan tests allow us to reject in all four cases the hypothesis that the days and hours regressions are independent. The correlation coefficients of the residuals are positive, underlining something we discovered in Table 1: workers who work, for unexplained reasons, more (fewer) hours also tend to work more (fewer) days. Still, the magnitudes of these correlation coefficients are small. Since the dependent variables are natural logarithms, we can compare the effect of the independent variables on hours and days. Significance levels of pairwise t-statistics are also given, which test the hypothesis that the effect of the independent variable is the same on both hours and days. The coefficients on the number of children in the days and hours

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[11] Weiss (1984) found that younger workers were more likely to quit than older workers, as were those who were not married and those with lower education.

[12] Both Farber (1980) and Freeman (1980) discussed the lower quit probabilities of unionists in the United States.

[13] Blau and Kahn (1981b), Meitzen (1986) and Sicherman (1996) all found a negative correlation between tenure and quit behavior.

[14] The hourly wage rate is not included as a regressor since it is generally derived from earnings per time period and the number of hours worked per time period. Thus, for example, if an individual was paid weekly, the hourly wage would be determined by dividing the weekly earnings by the number of weekly hours worked (i.e., number of daily hours usually worked multiplied by the number of days per week usually worked). Similar remarks apply to those paid on a less frequent basis. In each of these cases, introduction of the wage into the hours and/or days regressions would result in a negative spurious correlation with the hours and days variables. The exception to this rule is for those paid by the hour. In this case, the hourly wage is not derived, but rather collected independently of the hours and days data.

Table 3: OLS Estimates of log Hours and log Days, with and without Job Controls, Males and Females, 1990
(absolute values of t-statistics are in parenthesis)

	Males						Females					
	No Job Controls			Job Controls			No Job Controls			Job Controls		
Independent Variable	Hours	Days	*t*	Hours	Days	*t*	Hours	Days	*t*	Hours	Days	*t*
Personal Characteristics												
Age												
20-24 years	0.0493	0.0385		0.0501	0.0413		0.0327	0.0853	***	0.0248	0.0787	***
	(4.067)	(3.667)		(4.239)	(3.970)		(1.441)	(3.373)		(1.115)	(3.160)	
25-34 years	0.0549	0.0412		0.0537	0.0460		0.0225	0.0785	***	0.0010	0.0553	***
	(4.516)	(3.918)		(4.522)	(4.392)		(1.008)	(3.156)		(0.045)	(2.251)	
35-44 years	0.0371	0.0322		0.0427	0.0392		0.0106	0.0688	***	-0.0175	0.0385	***
	(3.006)	(3.007)		(3.518)	(3.667)		(0.467)	(2.735)		(0.787)	(1.542)	
45-54 years	0.0227	0.0310		0.0317	0.0377		-0.0176	0.0395	***	-0.0413	0.0118	***
	(1.792)	(2.832)		(2.530)	(3.414)		(0.763)	(1.541)		(1.816)	(0.463)	
55-64 years	-0.0165	0.0198	**	-0.0036	0.0269	*	-0.0807	-0.0362		-0.1025	-0.0637	
	(1.251)	(1.732)		(0.278)	(2.337)		(3.371)	(1.360)		(4.319)	(2.399)	
Children												
Number of kids ages 0-2	-0.0023	-0.0031		-0.0030	-0.0035		-0.0195	-0.0742	*	-0.0163	-0.0681	*
	(0.579)	(0.893)		(0.752)	(1.003)		(2.867)	(9.788)		(2.430)	(9.102)	
Number of kids ages 3-5	0.0059	0.0005		0.0060	0.0012		-0.0332	-0.0645	*	-0.0320	-0.0616	*
	(1.507)	(0.152)		(1.590)	(0.354)		(5.153)	(9.012)		(5.078)	(8.726)	
Number of kids ages > 5	0.0022	0.0007		0.0011	0.0005		-0.0192	-0.0277	*	-0.0167	-0.0224	***
	(1.445)	(0.559)		(0.725)	(0.348)		(7.749)	(10.082)		(6.843)	(8.206)	
Marital Status												
Single	-0.0216	-0.0094	***	-0.0170	-0.0070		0.0062	0.0306	***	0.0069	0.0317	***
	(3.966)	(2.002)		(3.203)	(1.489)		(0.586)	(2.583)		(0.660)	(2.717)	
Other	0.0033	-0.0106		0.0031	-0.0104		0.0182	0.0395		0.0192	0.0400	
	(0.477)	(1.756)		(0.459)	(1.737)		(1.648)	(3.215)		(1.779)	(3.304)	
Relationship to Family Head												
Spouse	-0.0070	-0.0106		-0.0018	-0.0088		-0.0201	-0.0207		-0.0195	-0.0191	
	(1.115)	(1.951)		(0.294)	(1.637)		(2.307)	(2.136)		(2.281)	(1.995)	
Other	-0.0293	-0.0147	***	-0.0309	-0.0168	***	-0.0063	-0.0229		-0.0042	-0.0217	
	(4.697)	(2.715)		(5.087)	(3.144)		(0.602)	(1.956)		(0.408)	(1.873)	
Education												
Some high school	-0.0149	-0.0168		-0.0047	-0.0140		0.0117	-0.0229	**	0.0183	-0.0183	**
	(2.626)	(3.401)		(0.847)	(2.849)		(1.033)	(1.808)		(1.621)	(1.448)	
Graduated high school	-0.0271	-0.0253		-0.0048	-0.0205	**	0.0215	-0.0239	*	0.0233	-0.0292	*
	(4.671)	(5.028)		(0.826)	(4.027)		(1.935)	(1.933)		(2.046)	(2.287)	
Some post-secondary	-0.0410	-0.0254	***	-0.0128	-0.0208		0.0225	-0.0341	*	0.0195	-0.0393	*
	(5.996)	(4.284)		(1.867)	(3.440)		(1.787)	(2.440)		(1.509)	(2.720)	
Post-secondary diploma	-0.0524	-0.0194	*	-0.0204	-0.0167		0.0603	-0.0586	*	0.0479	-0.0475	*
	(8.169)	(3.499)		(3.119)	(2.900)		(5.272)	(4.605)		(3.954)	(3.507)	
University degree	-0.0629	-0.0173	*	-0.0098	-0.0171		0.0513	-0.0294	*	0.0227	-0.0076	***
	(10.062)	(3.189)		(1.383)	(2.738)		(4.274)	(2.200)		(1.733)	(0.518)	
Trade	-0.0243	-0.0178		-0.0037	-0.0147		0.0343	-0.0250	*	0.0407	-0.0193	*
	(3.628)	(3.058)		(0.551)	(2.518)		(2.609)	(1.713)		(3.040)	(1.290)	
Region												
BC	0.0140	-0.0104	*	0.0099	-0.0129	*	-0.0104	-0.0324	***	-0.0010	-0.0201	
	(2.568)	(2.202)		(1.851)	(2.729)		(1.176)	(3.296)		(0.109)	(2.056)	
Prairies	0.0113	0.0035		0.0080	-0.0029	**	-0.0154	-0.0365	**	-0.0041	-0.0274	**
	(2.649)	(0.948)		(1.886)	(0.780)		(2.331)	(4.965)		(0.626)	(3.732)	
Quebec	-0.0279	-0.0022	*	-0.0183	-0.0012	**	-0.0300	-0.0021	**	-0.0294	-0.0029	***
	(4.457)	(0.408)		(2.986)	(0.227)		(3.006)	(0.192)		(3.005)	(0.267)	
Atlantic	0.0152	0.0133		0.0134	0.0080		0.0172	0.0255		0.0257	0.0335	
	(3.440)	(3.469)		(3.043)	(2.071)		(2.459)	(3.284)		(3.672)	(4.282)	
Mother Tongue												
French	0.0036	-0.0041		-0.0021	-0.0034		-0.0024	0.0022		-0.0025	0.0065	
	(0.678)	(0.888)		(0.399)	(0.760)		(0.287)	(0.232)		(0.297)	(0.700)	
Other	-0.0152	-0.0042		-0.0191	-0.0030	**	-0.0063	0.0015		-0.0084	-0.0005	
	(2.377)	(0.758)		(3.068)	(0.551)		(0.640)	(0.132)		(0.870)	(0.049)	
Other												
Immigrant	0.0095	0.0104		0.0115	0.0100		-0.0019	0.0056		-0.0015	0.0092	
	(1.498)	(1.906)		(1.870)	(1.834)		(0.193)	(0.515)		(0.155)	(0.851)	
Visible minority	-0.0243	-0.0059	***	-0.0153	-0.0025		0.0475	0.0765		0.0427	0.0680	
	(2.767)	(0.781)		(1.794)	(0.328)		(3.446)	(4.994)		(3.159)	(4.498)	
Job Characteristics												
Firm Size												
20-99 employees				0.0145	-0.0107	*				0.0509	0.0298	**
				(3.041)	(2.547)					(6.797)	(3.554)	
100-499 employees				0.0209	-0.0137	*				0.0515	0.0326	
				(3.876)	(2.899)					(6.197)	(3.509)	
500 or more employees				0.0147	-0.0188	*				0.0287	0.0329	
				(3.278)	(4.756)					(4.298)	(4.406)	
Don't know				0.0135	-0.0022	**				-0.0048	0.0236	*

Table 3 continued

				(2.671)	(0.488)					(0.629)	(2.746)	
Industry Group												
Goods Sector												
Construction				-0.0460	0.0143	*				-0.0730	0.0229	*
				(5.366)	(1.892)					(2.893)	(0.812)	
Manufacturing				-0.0808	-0.0040	*				0.0266	0.0477	
				(11.254)	(0.629)					(1.373)	(2.198)	
Service Sector												
Distributive services				-0.0926	0.0110	*				-0.0285	0.0270	**
				(12.776)	(1.719)					(1.486)	(1.257)	
Business services				-0.1093	-0.0003	*				-0.0171	0.0285	***
				(12.354)	(0.041)					(0.925)	(1.378)	
Consumer services				-0.1133	0.0016	*				-0.0197	-0.0059	
				(14.890)	(0.232)					(1.106)	(0.296)	
Education, health and welfare				-0.1377	-0.0007	*				-0.0723	-0.0310	
				(16.364)	(0.100)					(3.979)	(1.524)	
Public administration				-0.1124	-0.0012	*				-0.0304	0.0243	**
				(14.102)	(0.165)					(1.588)	(1.134)	
Occupation Group												
Managerial and administrative				0.0378	0.0389					0.0768	0.0610	
				(5.207)	(6.086)					(9.369)	(6.649)	
Professional and technical				0.0219	0.0312					0.0717	-0.0427	*
				(2.821)	(4.575)					(8.896)	(4.731)	
Sales				0.0321	0.0268					-0.0033	-0.0409	*
				(3.835)	(3.631)					(0.359)	(3.960)	
Service				0.0283	-0.0026	*				-0.0265	-0.0163	
				(3.599)	(0.375)					(3.442)	(1.899)	
Primary				0.0563	0.0678					0.0521	0.0966	
				(5.757)	(7.874)					(2.316)	(3.837)	
Processing				0.0663	0.0079	*				0.0668	0.0174	**
				(7.656)	(1.041)					(4.277)	(0.995)	
Machining, fabricating, assembling and repairing				0.0320	0.0269					0.0706	0.0172	**
				(4.522)	(4.305)					(4.524)	(0.983)	
Construction trades				0.0430	0.0236	***				0.1711	0.1125	
				(5.326)	(3.316)					(4.468)	(2.625)	
Transport operating and materials handling				0.0698	0.0153					-0.0185	-0.0136	
				(9.613)	(2.388)					(1.150)	(0.754)	
Other occupation				0.1344	0.0720					-0.0233	-0.0521	
				(1.981)	(1.206)					(0.211)	(0.420)	
Other												
Covered by union agreement				-0.0161	-0.0184					0.0313	0.0181	
				(4.735)	(6.152)					(5.281)	(2.730)	
Tenure at job (weeks/100)				-0.0001	0.0007	***				0.0026	0.0053	**
				(0.304)	(2.152)					(3.534)	(6.316)	
Covered by pension				-0.0024	0.0002					0.0105	0.0096	
				(0.849)	(0.080)					(2.190)	(1.789)	
Constant	2.1163	1.5883	*	2.1341	1.5712	*	1.9751	1.5201	*	1.9535	1.4841	*
	(151.034)	(130.867)		(127.509)	(106.577)		(75.150)	(52.004)		(61.491)	(41.755)	
R^2	0.0313	0.0086		0.0841	0.0305		0.0276	0.0696		0.0408	0.0713	
Correlation Coefficient of Residuals	0.1455			0.1379			0.1545			0.1371		
Breusch-Pagan Test of Independence (p-value)	0.0000			0.0000			0.0000			0.0000		
Number of Observations	16280			16280			14635			14635		

Notes: (1) Omitted categorical variables are age 17-19, married, head of household, elementary education, Ontario, English mother tongue, 19 or fewer employees, primary industry group and clerical occupation group.
(2) *, ** and *** denote that the pairwise t-statistics are significant at 1, 5 and 10 per cent, respectively.

regressions, for example, are significantly different in the case of females but not in the case of males. The results show that both men and women above 19 years of age work more hours and days compared to the control group of individuals between 17 and 19 years of age. For males, hours and days peak at 25-34 years of age while hours and days for females reach at maximum at 20-24 years of age. Throughout the remainder of the life-cycle, labour supply in both dimensions declines slowly. For both genders the increase in weekly hours is the result of a larger percentage increase in days than hours, but only in the case of women are these differences statistically significant at 10 per cent.

These results are somewhat at odds with those of Hamermesh (1996) who found that the inverse U-shaped pattern was steeper in the case of hours than days for both U.S. and German male and female workers. He reasoned that the steeper hours profile implied that hours are less costly to add than days. In our case, male workers do add hours slightly more rapidly than days until they reach their peaks between 25 and 34 years. Thereafter hours fall off more rapidly than days. Since 82 per cent of the males in our sample work a standard five-day workweek, flexibility in weekly hours obviously comes from changes in hours. For female workers, it is days that rise more rapidly to a peak at 20-24 years, and then both days and hours decline at a similar rate. Thus females appear to be more flexible in altering both days and hours than males.

Since women still generally hold the primary responsibility for child care, the presence of young children should decrease their labour supply. Indeed, the number of young children present does have a negative effect on supply of both hours and days. In the case of no job controls, the point estimates show that the presence of a child two years of age or less is related to a drop in hours of almost 2 per cent but a drop in days of over 7 per cent. By contrast, the presence of young children has no statistically significant effect on the male supply of hours and days. Thus, the data show that young children are correlated with a decline both the hours and days supplied by the mother. If the fixed costs of child care are incurred on a daily basis versus an hourly basis, we would expect the decline in labour supply to be borne by a larger decline in days. This indeed is the case.

V. Job Change Behavior and Hours per Day and Days per Week

Insofar as hours and days combinations within jobs are less than optimal for workers, we might expect job change to occur in order to attain the desired combination. Since the LMAS contains data on up to five job changes per worker per year, we can use this information to estimate a model of job change behavior that will help give further insights into the daily and hourly fixed costs of labour supply.

Modifying the labour force participation model of Blank (1988) we assume that an individual i in period j attains the utility level $U_i^j(H_i^j, D_i^j, E_i^j)$, where H_i^j is hours of work per day at the job held in period j, D_i^j is days per week at job j and $E_i^j = H_i^j \cdot D_i^j \cdot W_i^j$ represent the weekly earnings at job j which has an hourly wage rate of W_i^j. If we assume that the individual has perfect information about all the arguments in his/her utility function, and that job mobility is cost-free, then an individual will change jobs only if

$$(5) \qquad P^* = U_i^2(H_i^2, D_i^2, E_i^2) - U_i^1(H_i^1, D_i^1, E_i^1) \geq 0 .$$

If we further assume that P^* is linearly dependent on the three arguments in the utility function, as well as other demographic and economic variables that determine job change, we can write (5) as

$$(6) \qquad P^* = \lambda Z + v ,$$

where Z is the aforementioned vector of job change determinants, λ is its corresponding vector of coefficients, and v is the white noise error term. Utility is unobservable and therefore so is the variable P^*. What we do observe, however, is a dichotomous variable, P where

$$P = 1 \quad \text{if} \quad P* \geq 0 \quad \text{and} \quad P = 0 \quad \text{if} \quad P* < 0 .$$

If we assume that an individual is in equilibrium at the initial job, utility is being maximized. A shock which affects one or more arguments in the individual's utility function may result in the utility no longer being maximized at that job and job change will occur if utility can be maximized at a new job. The birth of a child, for example increases the fixed costs of employment along both time dimensions. If the fixed costs of hours are more costly than the fixed costs of days, we would expect job changers to want to move out of jobs with longer hours. Conversely, if days are more costly than hours, we would expect the probability of leaving to be positively related to the days variable.

Probit estimates of equation (6) appear in Table 4. Independent variables include all personal and job controls used in the previous analysis, plus variables for hours and days, a dummy which equals one if respondents said that they desired more monthly hours at their jobs, and interactions of this variable with hours and days. Separate probits are also estimated without personal and job controls. Of the 16,280 males in our sample, some 1,563 changed jobs in 1990 for a probability of .096. For women, the probability of moving from a first to a second job was .090 (1,318 changers from a sample of 14,635).

The effects of personal and job characteristics on job change very similar for both genders. Probability of job change decreases as age increases. The presence of small children also reduces the likelihood of job change for both genders, especially women. Older children have little influence on the job change behavior of men but continue to slightly lessen female mobility. Union members tend to exhibit less job mobility as do those with more job tenure. These results are consistent with the literature, much of which has been discussed above.

The marginal effects of hours, days and wanting extra monthly hours on job change probability are presented in Table 5, again with and without control variables. For males, the number of hours and days worked at their initial jobs have little effect on job change probability, although in the case of no controls the days coefficient is twice as large as the hours coefficient and both are significant. The effect of desire for extra hours, however, is quite large, especially when no controls are included.[15] For females, a similar pattern emerges as the days coefficient is much larger than the hours coefficient. In each instant the coefficients are significant. The effect of the desire to work extra hours is also large in each case compared to the predicted probabilities of the model.[16] These results lend some support to the notion that the addition of days are more costly than the addition of hours. The desire to work extra hours also significantly increases the probability of job change for both genders. Thus, those who want extra monthly hours at their first job have a higher propensity to leave their first jobs in order to find their desired hours and days combination. This explains a significant proportion of the probability of job change.

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[15] In the case of controls (no controls) the predicted probabilities of the model are .095 (.061).

[16] The predicted probabilities are .058 (.088) when controls are included (excluded).

Table 4: Probit Estimates Job Change Probability, Males and Females

(absolute values of t-ratios are in parenthesis)

Independent Variable	Males				Females			
	Coefficient	Partial Deriv.	Coefficient	Partial Deriv.	Coefficient	Partial Deriv.	Coefficient	Partial Deriv.
Hours per day	0.0320	0.005	0.0081	0.001	0.0383	0.006	0.0245	0.003
	(3.475)		(0.785)		(3.587)		(2.076)	
Days per week	0.0851	0.014	0.0132	0.002	0.0945	0.015	0.0675	0.008
	(3.570)		(0.526)		(4.980)		(3.274)	
Extra hours wanted	1.6149	0.486	0.7059	0.128	0.7233	0.162	0.5091	0.080
	(5.786)		(2.417)		(3.306)		(2.221)	
Extra hours wanted*hours per day	-0.0326	-0.005	0.0089	0.001	-0.0112	-0.002	0.0005	0.000
	(1.277)		(0.331)		(0.485)		(0.020)	
Extra hours wanted*days per week	-0.2215	-0.037	-0.1393	-0.017	-0.0572	-0.009	-0.0640	-0.007
	(4.907)		(2.951)		(1.650)		(1.745)	
Personal Characteristics								
Age								
20-24 years			-0.3175	-0.031			-0.0946	-0.010
			(3.473)				(0.813)	
25-34 years			-0.4612	-0.049			-0.2857	-0.031
			(4.909)				(2.454)	
35-44 years			-0.5015	-0.052			-0.4395	-0.045
			(5.129)				(3.657)	
45-54 years			-0.6067	-0.055			-0.5827	-0.052
			(5.835)				(4.651)	
55-64 years			-0.8847	-0.063			-0.7925	-0.055
			(7.601)				(5.539)	
Children								
Number of kids ages 0-2			-0.1103	-0.013			-0.2763	-0.032
			(2.763)				(5.826)	
Number of kids ages 3-5			-0.0031	0.000			-0.0655	-0.008
			(0.082)				(1.509)	
Number of kids ages 6 and up			-0.0198	-0.002			-0.0356	-0.004
			(1.249)				(2.080)	
Marital Status								
Single			-0.0396	-0.005			-0.0178	-0.002
			(0.769)				(0.265)	
Other			-0.0164	-0.002			0.0430	0.005
			(0.221)				(0.577)	
Relationship to Family Head								
Spouse			0.1351	0.018			-0.0669	-0.008
			(2.258)				(1.161)	
Other			-0.0430	-0.005			-0.0046	-0.001
			(0.758)				(0.072)	
Education								
Some high school			0.0105	0.001			0.0349	0.004
			(0.178)				(0.427)	
Graduated high school			-0.0197	-0.002			0.0534	0.006
			(0.320)				(0.650)	
Some post-secondary			0.0882	0.011			0.1444	0.018
			(1.241)				(1.595)	
Post-secondary diploma			0.0034	0.000			0.1466	0.018
			(0.048)				(1.677)	
University degree			0.0372	0.005			0.1460	0.018
			(0.486)				(1.522)	
Trade			0.0998	0.013			0.1787	0.023
			(1.445)				(1.901)	
Region								
BC			0.0524	0.006			0.0393	0.005
			(0.933)				(0.665)	
Prairies			0.0295	0.004			0.0056	0.001
			(0.660)				(0.124)	
Quebec			-0.0629	-0.007			-0.2732	-0.027
			(0.967)				(3.892)	
Atlantic			-0.0814	-0.009			-0.1195	-0.013
			(1.719)				(2.440)	
Mother Tongue								
French			0.0298	0.004			0.0801	0.010
			(0.558)				(1.395)	
Other			-0.0423	-0.005			-0.0701	-0.008

Table 4 continued

			(0.617)				(0.976)	
Other								
Immigrant			0.0123	0.001			0.0032	0.000
			(0.183)				(0.046)	
Visible minority			-0.1113	-0.012			-0.1641	-0.017
			(1.210)				(1.675)	
Job Characteristics								
Firm Size								
20-99 employees			0.0083	0.001			-0.0383	-0.004
			(0.186)				(0.756)	
100-499 employees			-0.0438	-0.005			0.0710	0.009
			(0.806)				(1.234)	
500 or more employees			-0.1401	-0.016			-0.0098	-0.001
			(3.084)				(0.214)	
Don't know			-0.0826	-0.009			0.0521	0.006
			(1.656)				(1.028)	
Industry Group								
Goods Sector								
Construction			0.0635	0.008			0.1416	0.018
			(0.741)				(0.784)	
Manufacturing			-0.0400	-0.005			0.1652	0.021
			(0.524)				(1.187)	
Service Sector								
Distributive services			-0.0678	-0.008			0.2640	0.037
			(0.875)				(1.906)	
Business services			-0.0594	-0.007			0.3325	0.047
			(0.651)				(2.511)	
Consumer services			0.0223	0.003			0.2954	0.038
			(0.285)				(2.295)	
Education, health and welfare			-0.2056	-0.022			0.1287	0.016
			(2.182)				(0.975)	
Public administration			-0.1126	-0.013			0.3881	0.058
			(1.267)				(2.815)	
Occupation Group								
Managerial and administrative			-0.2288	-0.024			0.0399	0.005
			(2.908)				(0.705)	
Professional and technical			-0.0114	-0.001			-0.0070	-0.001
			(0.140)				(0.118)	
Sales			-0.0810	-0.009			-0.0542	-0.006
			(0.968)				(0.884)	
Service			-0.0858	-0.010			0.0134	0.002
			(1.053)				(0.259)	
Primary			-0.1262	-0.014			0.1848	0.025
			(1.255)				(1.208)	
Processing			-0.1812	-0.019			0.2691	0.038
			(1.929)				(2.676)	
Machining, fabricating, assembling and repairing			-0.1923	-0.021			0.1075	0.014
			(2.571)				(1.000)	
Construction trades			-0.0160	-0.002			0.6270	0.114
			(0.190)				(3.000)	
Transport operating and materials handling			-0.1672	-0.018			0.0138	0.002
			(2.165)				(0.127)	
Other occupation			-0.0703	-0.008			variable dropped	
			(0.110)					
Other								
Covered by union agreement			-0.2112	-0.025			-0.2825	-0.031
			(5.731)				(6.550)	
Tenure at job (weeks/100)			-0.1178	-0.014			-0.1455	-0.017
			(18.109)				(15.501)	
Covered by pension			0.0179	0.002			0.0169	0.002
			(0.600)				(0.506)	
Constant	-2.0415		-0.3284		-2.1243		-1.3173	
	(15.141)		(1.557)		(18.198)		(5.553)	
Pseudo R^2	0.008		0.126		0.012		0.118	
X^2	84.06		1279.95		101.50		1047.77	
Observed P		0.096		0.096		0.090		0.090
Predicted P		0.095		0.061		0.088		0.058
Number of Observations		16280				14629		

Note: Omitted categorical variables are age 17-19, married, head of household, elementary education, Ontario, English mother tongue, 19 or fewer employees, primary industry group and clerical occupation group.

Table 5: Effect of Independent Variables on Predicted Job Change Probability
(absolute values of t-ratios are in parenthesis)

	Males		Females	
	w/o controls	w/ controls	w/o controls	w/ controls
Hours	0.006	0.001	0.009	0.002
	(3.339)	(0.870)	(3.800)	(2.277)
Days	0.011	0.000	0.018	0.007
	(2.906)	(0.018)	(5.136)	(3.219)
Extra hours wanted	0.046	0.010	0.081	0.030
	(8.422)	(1.665)	(7.792)	(4.233)

That extra hours are desired indicates that the individual may not be in equilibrium at his/her current job. The interactions of the extra hours variable with the days and hours variables in Table 4 provide us with additional information about the reasons for job change. If a lack of hours (or days) on the current job is the constraint on lower-than-desired total hours and thus at least part of the motivation for seeking new employment, then we would expect a negative coefficient on the interaction term. For example, if one wanted extra days per week, the probability of job change should decrease as the number of days at the current job increase. The significant negative coefficients on the extra hours/days interaction variable of both genders support this assertion. For the extra hours/hours interaction, however, we cannot reject the null hypothesis of no effect on job change behavior. Thus, an individual who wants extra hours is less likely to leave his current job as days per week increase, while hours per day have little effect on job change behavior.

In terms of fixed costs of employment, these results suggest that for individuals who do not desire extra hours, the fixed costs of additional days of work are higher, at least within their first jobs, than those of additional hours of work since the increase in job change probability is greater for a unit increase in days than a unit increase in hours. For those of both genders who want more monthly hours there is evidence of a trade-off in the job change decision. On the one hand, a larger number of days at the worker's initial job has a larger effect on job change behavior than an increase in hours. On the other, the demand for extra hours lessens the probability of job change if this desire can be satisfied within the initial job. This is still consistent with the hypothesis of higher daily fixed costs and simply suggests that the monetary benefits to working extra days far outweigh the fixed costs of doing so.

These estimates do give us some insight into what motivates job change, but they tell us little about the changes in hours and days combinations that are the result of job change. This is addressed in the following section.

VI. Detailed Analysis of Job Changers

Tables 6 and 7 show the extent to which the means and variances of log days and log hours vary as workers change jobs. In both these tables, columns 1 through 4 display the means and variances of log hours and log days for each of the two jobs held for job changers, and the one job held for job stayers.

Table 6: Selected Means and Variances of log Hours and log Days, Jobs 1 and 2, and First Differences, for Male Job Stayers and Job Changers

		Job 1		Job 2		First Differences			Tests for differences in Means	Tests for differences in Variance
		lnHours	lnDays	lnHours	lnDays	ΔlnWHours	ΔlnHours	ΔlnDays	$z =$	$F =$
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Job Stayers (n=14,577)	μ	2.116	1.602	N/A	N/A	N/A	N/A	N/A		
	σ^2	.0341	.0234	N/A	N/A	N/A	N/A	N/A		
Job Changers (n=1,563)	μ	2.128	1.596	2.132	1.598	.0067	.0040	.0027	0.146	
	σ^2	.0395	.0423	.0433	.0394	.1497	.0578	.0664		1.149 **
Voluntary (n=1,000)	μ	2.119	1.589	2.125	1.603	.0190	.0058	.0131	0.709	
	σ^2	.0429	.0389	.0412	.0276	.3548	.0548	.0511		1.072
Involuntary (n=563)	μ	2.142	1.607	2.143	1.591	-.0150	.0007	-.0158	0.990	
	σ^2	.0331	.0483	.0470	.0602	.1916	.0632	.0933		1.476 *
Extra Hours Preferred (n=230)	μ	2.045	1.459	2.117	1.570	.1824	.0714	.1110	1.400	
	σ^2	.0584	.0942	.0379	.0390	.2134	.0686	.1155		1.684 *
Extra Hours Not Preferred (n=1,333)	μ	2.142	1.619	2.134	1.603	-.0236	-.0076	-.0160	0.921	
	σ^2	.0349	.0299	.0442	.0393	.1326	.0551	.0557		1.011

Note: * and ** denote significance at the 1 and 5 per cent levels, respectively.

Table 7: Selected Means and Variances of log Hours and log Days, Jobs 1 and 2, and First Differences, for Female Job Stayers and Job Changers

		Job 1		Job 2		First Differences			Tests for differences in Means	Tests for differences in Variance
		lnHours	lnDays	lnHours	lnDays	ΔlnWHours	ΔlnHours	ΔlnDays	$z =$	$F =$
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Job Stayers (n=13,245)	μ	1.967	1.491	N/A	N/A	N/A	N/A	N/A		
	σ^2	.0813	.0100	N/A	N/A	N/A	N/A	N/A		
Job Changers (n=1,318)	μ	1.996	1.520	1.997	1.507	-.0113	.0080	-.0121	1.624	
	σ^2	.0469	.0784	.0547	.0909	.2429	.0732	.1287		1.758 *
Voluntary (n=998)	μ	1.991	1.509	1.998	1.518	.0162	.0071	.0091	0.146	
	σ^2	.0462	.0814	.0453	.0787	.2306	.0690	.1179		1.709 *
Involuntary (n=320)	μ	2.012	1.553	1.993	1.475	-.0969	-.0188	-.0782	2.157 **	
	σ^2	.0488	.0670	.0841	.1280	.2724	.0858	.1569		1.829 *
Extra Hours Preferred (n=238)	μ	1.862	1.329	1.985	1.483	.2768	.1225	.1542	0.845	
	σ^2	.0814	.1692	.0635	.0989	.3967	.1072	.2275		2.122 *
Extra Hours Not Preferred (n=1,080)	μ	2.026	1.562	2.000	1.513	-.0747	-.0206	-.0487	2.299 **	
	σ^2	.0345	.0487	.0528	.0891	.1870	.0618	.0996		1.612 *

Note: * and ** denote significance at the 1 and 5 per cent levels, respectively.

Column 5 shows the mean changes in log weekly hours as well as the corresponding variances. Columns 6 and 7 disaggregate weekly hours changes into changes in log hours and log days. Columns 8 and 9 display the test statistics for differences in the means and variances in log hours and log days changes.[17] We also disaggregate the sample of job changers; first into voluntary and involuntary job changers, and then into those who wanted extra hours at their first job and those who did not. In each of these two subsamples, significant differences exist between the two groups in terms of mean changes and variances in almost every time dimension. Thus, for example, both the means and variances of changes in weekly hours are significantly different when comparing those who desired extra monthly hours with those who did not.[18] The evidence appears to support the hypothesis that flexibility in weekly work schedules is important to employees.

Males who changed jobs worked slightly more hours per day and marginally fewer days per week at their initial jobs compared to those who did not change jobs, although only the former difference is statistically significant. The variances of both log hours and log days, however, are significantly higher in the case of job changers than job stayers. Thus, although we cannot reject the hypothesis that the average job changer works the same number of daily hours as the average job stayer, job changers show much more variation in their work schedules at their initial jobs, and this variation persists as they move into new jobs. This is generally consistent with the results of Altonji and Paxson (1986) who found that the variance of time worked in a number of dimensions (hours/week, weeks/year or hours/year) increased for people who changed jobs, relative to those who did not change jobs.[19]

[17] Throughout this section we use the statistic

$$z = (\overline{X_1} - \overline{X_2}) / \sqrt{(s_1^2 / n_1) + (s_2^2 / n_2)}\ ,$$

where $\overline{X_1}, \overline{X_2}$ are the sample means of the two distributions, s_1^2, s_2^2 are the corresponding estimated variances, and n_1, n_2 are the sample sizes. With large sample sizes, this is approximates a normal distribution. For testing differences in estimated variances, we use the statistic

$$F_{n_1-1, n_2-1} = s_1^2 / s_2^2\ ,$$

where the variables have already been defined and $s_1^2 \geq s_2^2$. The same statistics are used for inter-group comparisons.

[18] All such pairwise comparisons are statistically different (at at least the 10 per cent level) in both means and variances of changes in the appropriate time dimension. The only exceptions to this rule are the means of log daily hours at the first job between male job stayers and job changers, mean changes in log weekly hours and log daily hours between male voluntary and involuntary changers, and mean changes in log daily hours between female voluntary and involuntary changers.

[19] This analysis suffers from censored data since we are only able to observe hours/days changes for people who actually change jobs. Altonji and Paxson (1986), by contrast, have panel data and thus are able to use a "difference-in-difference" approach to determine the "net" change in hours. Their limitation, of course, is the inability to break down weekly hours into its days and hours components.

For all male job changers, column 5 of Table 6 shows that job changers worked marginally more weekly hours at their new jobs. Disaggregating these changes into changes in hours and days, however, we cannot reject the hypothesis that the change in weekly hours was the result of equal changes in both hours and days. The variance of days changes, however, is higher than that of hours at the 5 per cent level of significance. Voluntary changers had an increase in log weekly hours of .019, again with the adjustment coming equally from increases in hours and days. Involuntary changers, by contrast, had a decline of .015 in log weekly hours. Although the hypothesis that this change came equally from changes in hours and days cannot be rejected, we see that the variance of the change in days is significantly higher than the change in hours.

Males who wanted extra hours had an increase in log weekly hours of .182 compared to a decline of .024 for those who did not. Only in the former case, however, is the variance the change in log days significantly higher than the change in log hours. The higher variances for those desiring extra hours also imply a great deal of flexibility in finding the preferred combinations of hours and days. Similar results are obtained by Altonji and Paxson (1988,1992) who find that workers who desire to work more weekly hours are in fact more likely to increase these hours when they change jobs.

The results for females are presented in Table 7 and show much more variation in all time dimensions compared to males. Comparing the distributions of hours and days on the first job between stayers and changers, both means are significantly larger for job changers. For job changers the variance in log hours is significantly smaller than for stayers while the opposite holds for the variance on log days. Female job changers find new jobs with only marginally more hours and marginally fewer days compared to their previous positions, in neither case are the differences significant. Changers do, however, move into jobs with significantly higher variances in both days and hours.

For all female job changes, average total weekly hours declined slightly following job change, although the changes in hours and days are statistically indistinguishable. The variance of hours changes, however, is statistically much smaller than the variance of days changes. Voluntary changers had a modest increase in weekly hours compared to involuntary changes. Only in the latter case, however, can we say that the bulk of this change was the result of the steep decline in days. Those women who wanted

extra hours increased their log weekly hours by an average of .277, the result of an equal increase in both hours and days. Those who did not want extra hours saw their mean log weekly hours decline by .075, with most of this decline the result of a drop in days. In each case, the variance of the days change is statistically larger than that of the hours change.

Both male and female job changers experience changes in days and hours as they change jobs. Mean differences, however, appear to hide important details. In many cases we cannot say with certainly that the adjustment in weekly hours is the result of either changes in days or hours. The fact that the variance of changes in days is frequently significantly larger in the case of males, and always significantly larger in the case of females, shows that the changes in days are much more flexible than changes in hours when workers change jobs. This then implies that changes in days are less flexible than changes in hours within jobs.

In sum, we have seen that job changers have a larger number of hours and days, generally with higher variances at their initial jobs compared to those who do not change jobs. Job change does not increase the average number of hours or days amongst changers but, with the exception of changes in male days, variances also increase. Voluntary job changers of both genders experience higher average increases in both days and hours than those who do not change jobs voluntarily, although the variances in the changes of log hours and log days are larger for involuntary movers. Finally, those desiring extra hours at their initial jobs are likely to find these extra hours in the form of both more daily hours and more days per week, with the variances here smaller than those who did not want extra hours.

The above analysis gives us a good idea of the differences in mean hours and days changes along with their dispersions as job changers move from one job to the next. This analysis, however, clouds that direction of changes in hours and days as workers move between jobs. Looking at the direction and magnitude of changes in hours and days by job changers may offer some insights into what motivates job change. If daily fixed costs are indeed relatively high compared to hourly fixed costs, we would expect individuals to sort into new jobs with fewer days and more hours compared with their previous jobs, all other things equal. Furthermore, we might expect these changes to be especially pronounced in the case of voluntary job changers since they presumably are less constrained in their choices of new hours and

days combinations than those who change involuntary. We might also expect those who want extra hours to attain these hours by increasing their daily hours rather than by increasing days. Females, who have exhibited more flexibility in our sample, might also be more likely to change into jobs with relatively fewer days and more hours.

Tables 8 and 9 show contingency tables for days and hours changes for male and female job changers. In all but one case, χ^2 values allow us the reject the hypothesis that the distributions of days and hours are independent.[20] In other words, changes in hours and days between jobs are not purely random. In each of the 10 panels in Tables 8 and 9, no change in days is more likely than no change in hours for job changers. Thus it appears that rigidities in days are more prevalent than changes in hours. If larger fixed costs are incurred on a daily basis, these results are what we would expect.

The second and third panels of Table 8 show that there are differences between voluntary and involuntary job changers. If voluntary job changers are able to sort into a more palatable days/hours combination when they change jobs, and if the fixed costs of adding a day of work are higher than adding more hours, we would expect positive hours changes to be more likely as workers move between jobs. If we simply look at aggregate days and hours changes, this does not appear to be the case. Although voluntary changers are more likely to hold on to both their original days and hours, the distributions show few other differences, if we only look at column and row totals. However, what is interesting is the off-diagonal elements of each panel. In this case voluntary changers were about as likely to increase days and decrease hours as they were to do the opposite. Involuntary changers, however, were more likely to increase hours and decrease days than to decrease hours jointly with increasing days. This is the opposite of what we expected, although somewhat supportive of the higher daily fixed costs hypothesis. This also suggests that factors other than the fixed costs of days and hours exert more of an influence on voluntary job changers as they sort into new jobs with different hours/days combinations.

Those who said they wanted additional hours at their first jobs do, however, display important differences compared to those who did not want extra hours. Job changers were more likely to have both

[20] The exception is in the case of females who desired extra hours. Given that the distribution is skewed in favour of both more days and more hours, the fact that we can't reject the independence hypothesis comes as little surprise.

Table 8: Changes in Hours and Days for Male Job Changers
(percentages)

	All Job Changers (n=1563)					
	Δ Hours					
Δ Days	>=2.0	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	2.94	0.70	1.41	0.38	0.70	6.14
1	2.82	1.15	3.20	0.90	1.60	9.66
0	4.73	5.63	49.07	5.76	4.67	69.87
-1	2.30	0.45	2.11	1.15	1.98	8.00
<-1	1.15	0.13	2.05	0.38	2.62	6.33
Total	13.95	8.06	57.84	8.57	11.58	100.00

X^2 *(16 d.f.) = 400.33 (p = .000)*

	Voluntary Job Changers (n=1000)					
	Δ Hours					
Δ Days	>=2.0	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	3.30	0.40	1.10	0.50	0.80	6.10
1	2.40	1.40	3.10	1.10	1.30	9.30
0	4.20	5.70	51.00	6.40	4.60	71.90
-1	2.30	0.40	1.40	1.20	2.10	7.40
<-1	0.80	0.10	2.20	0.50	1.70	5.30
Total	13.00	8.00	58.80	9.70	10.50	100.00

X^2 *(16 d.f.) = 278.68 (p = .000)*

	Involuntary Job Changers (n=563)					
	Δ Hours					
Δ Days	>=2.0	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	2.31	1.24	1.95	0.18	0.53	6.22
1	3.55	0.71	3.37	0.53	2.13	10.30
0	5.68	5.51	45.65	4.62	4.80	66.25
-1	2.31	0.53	3.37	1.07	1.78	9.06
<-1	1.78	0.18	1.78	0.18	4.26	8.17
Total	15.63	8.17	56.13	6.57	13.50	100.00

X^2 *(16 d.f.) = 151.88 (p = .000)*

	Extra Hours Preferred (n=230)					
	Δ Hours					
Δ Days	2.0+	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	6.96	1.30	3.48	2.61	2.17	16.52
1	6.96	2.61	3.04	1.30	1.30	15.22
0	6.09	3.48	41.74	4.78	2.17	58.26
-1	3.04	0.00	0.87	0.87	1.30	6.09
<-1	0.87	0.00	2.17	0.00	0.87	3.91
Total	23.91	7.39	51.30	9.57	7.83	100.00

X^2 *(16 d.f.) = 73.98 (p = .000)*

	Extra Hours Not Preferred (n=1333)					
	Δ Hours					
Δ Days	>=2.0	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	2.25	0.60	1.05	0.00	0.45	4.35
1	2.10	0.90	3.23	0.83	1.65	8.70
0	4.50	6.00	50.34	5.93	5.10	71.87
-1	2.18	0.53	2.33	1.20	2.10	8.33
<-1	1.20	0.15	2.03	0.45	2.93	6.75
Total	12.23	8.18	58.96	8.40	12.23	100.00

X^2 *(16 d.f.) = 336.48 (p = .000)*

Table 9: Changes in Hours and Days for Female Job Changers
(percentages)

All Job Changers (n=1318)

Δ Days	Δ Hours >=2.0	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	2.58	1.44	2.35	0.53	1.37	8.27
1	2.43	1.29	2.35	0.61	1.52	8.19
0	4.86	8.27	39.45	4.48	8.35	65.40
-1	1.21	1.29	2.50	0.46	2.43	7.89
<-1	0.91	1.21	3.19	0.46	4.48	10.24
Total	11.99	13.51	49.85	6.53	18.13	100.00

X^2 (16 d.f.) = 209.66 (p = .000)

Voluntary Job Changers (n=998)

Δ Days	Δ Hours >=2.0	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	2.71	1.70	2.51	0.60	1.40	8.92
1	2.40	1.00	2.20	0.50	1.60	7.72
0	4.61	8.12	42.28	5.31	8.12	68.44
-1	1.20	1.40	2.10	0.30	1.80	6.81
<-1	0.90	0.80	2.61	0.40	3.41	8.12
Total	11.82	13.03	51.70	7.11	16.33	100.00

X^2 (16 d.f.) = 164.58 (p = .000)

Involuntary Job Changers (n=320)

Δ Days	Δ Hours >=2.0	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	2.19	0.62	1.88	0.31	1.25	6.25
1	2.50	2.19	2.81	0.94	1.25	9.69
0	5.62	8.75	30.63	1.88	9.06	55.94
-1	1.25	0.94	3.75	0.94	4.38	11.25
<-1	0.94	2.50	5.00	0.62	7.81	16.88
Total	12.50	15.00	44.06	4.69	23.75	100.00

X^2 (16 d.f.) = 53.19 (p = .000)

Extra Hours Preferred (n=238)

Δ Days	Δ Hours >=2.0	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	9.24	5.04	5.88	1.26	1.68	23.11
1	6.72	3.78	6.72	1.68	1.68	20.59
0	9.24	6.30	15.97	1.26	5.88	38.66
-1	2.10	2.10	3.36	0.84	2.10	10.50
<-1	2.52	0.84	0.84	0.42	2.52	7.14
Total	29.83	18.07	32.77	5.46	13.87	100.00

X^2 (16 d.f.) = 21.42 (p = .163)

Extra Hours Not Preferred (n=1080)

Δ Days	Δ Hours >=2.0	0.1-2.0	0	<0 & >-2	<=-2	Total
>1	1.11	0.65	1.57	0.37	1.30	5.00
1	1.48	0.74	1.39	0.37	1.48	5.46
0	3.89	8.70	44.63	5.19	8.89	71.30
-1	1.02	1.11	2.31	0.37	2.50	7.31
<-1	0.56	1.30	3.70	0.46	4.91	10.93
Total	8.06	12.50	53.61	6.76	19.07	100.00

X^2 (16 d.f.) = 166.24 (p = .000)

positive hours and days changes if they wanted extra hours than if they did not. Again, the off-diagonal elements show that these job changes had a higher propensity to accept more days in combination with fewer hours than fewer days and more hours. These results are contrary to our expectations.

Female job changers show more flexibility in changing work schedules compared to males. This is reflected by the fact that they are less likely to move between jobs with identical hours and days pairs compared to males. Subsamples within female job changers exhibit similar patterns to those of male job changers. The off-diagonal elements show that in each of the five cases, female job changers are marginally more likely to move into jobs with more hours and fewer days than into jobs with more days and fewer hours. This evidence is mildly supportive of our hypothesis of higher fixed costs of working more days.

In sum, these results suggest that there is a great deal of rigidity in job schedules. This is especially true of days per week since job changers are less likely to change days that to change hours. As we have already discussed above (Table 1), females generally have more flexibility in their work schedules than men. Job change simply increases this flexibility.

VII. Conclusions

By disaggregating weekly labour supply into hours per day and days per week we have learned several interesting things. Among them:

- In bivariate distributions, employees tend to be clustered around standard hours and days, with men on average exhibiting less flexibility in hours and days worked than women. The self-employed are much less likely to work standard hours and days. Most of the self-employed males work both more hours and days compared to paid employees. Self-employed females also work more hours and days, but they are also more likely to work fewer hours per day.

- OLS estimates of hours and days supplied show that women with young children supply less labour in both dimensions, although the percentage drop in days is significantly larger. This implies that child care costs are borne on a daily basis, or at least are higher on a daily basis than an hourly basis.

- Probit estimates show that a larger number of days per week at the worker's initial job are significantly related to an increased probability of job change, especially among females. Hours per day are also a significant determinant of job change for females, but have little effect on male job change behavior. For both genders, the desire for extra hours is related to increased probability of job change. As extra days are added at the initial job, however, this probability declines. The addition of hours at the initial job, however, has no significant effect on job change among those who want extra monthly hours. These results suggest that the daily costs of employment may higher than the hourly costs, although these higher costs may outweighed by the benefits of working more days for those who desire additional hours.

- A more detailed analysis of hours and days changes shows that job changers desire flexibility in their weekly work schedules. Not only do job changers show more variability in their days and hours compared to job stayers at their first jobs, but this carries over to their new jobs as well. The wider distribution in days changes compared to hours changes implies that flexibility in days per week is more important amongst job changers than flexibility in hours per day. That working standard days is more common that working standard hours in the sample simply underlines the importance of flexibility in days, at least amongst job changers.
- The direction of hours and days changes suggests that there is a great deal of rigidity in weekly work schedules, especially in terms of days. Male job changers are much more likely than females to move into new jobs with the same or very similar days and hours combinations. The fact that women are marginally more likely to increase hours and decrease days than to do the opposite, is mildly supportive of the hypothesis of higher daily fixed costs.

On the basis of the evidence presented above, we cannot say conclusively that the daily or hourly costs of employment drive the behavior of individuals, although they do appear to be influential. We can conclude that workers do desire more flexibility in their choice of hours and days. This is particularly true of days. Our analysis also points to the difficulty that workers may encounter in trying to attain optimal

hours and days combinations. We can also conclude the using weekly hours or even more aggregated labour supply data hides important differences in the labour supply decisions of individuals.

Underlying that fact that the common labour supply aggregates hide important details are a host of policy implications. The importance of young children in the female labour force participation decision is already well-known. The evidence presented above also shows that the presence of young children influences labour supply differently in the hours and days dimensions. This suggests that policies that reduce the daily costs of child care might be more important than those that reduce the hourly costs. Company provision of childcare facilities at the worksite, for example, could reduce result in significant savings to parents in terms of the time and dollar expenses of delivering children to the outside facility before commuting to work. For the employer, a better understanding of workers' time preferences may could mean lower turnover rates, thus lowering the costs normally associated with employee turnover.

The increase in flexible working schedules has been arguably been useful in reducing rush-hour traffic congestion in many North American cities (although increasing the length of the "hour"). This has likely resulted in reduced daily commuting times and the costs of traveling to and from the worksite. Further flexibility could further reduce these daily commuting costs. As cities continue to spread out over larger geographical areas, commute times and expenses grow. This factor, along with the growth in appropriate technology, is undoubtedly a reason for the increased popularity of telecommuting. What does having the ability to work at home imply about the desired hours/days combination? Clearly the costs of both time dimensions decrease, but what is the optimal combination for the employee? Related to this are public policy decisions regarding the provision of roadways and public transportation. Such decisions could benefit from a better understanding of the days and hours preferences of individuals. If employees prefer to have more flexible daily hours or work fewer days per week, clearly a large investment in public transportation facilities would not be warranted as the number of daily trips would be reduced.

Clearly there is much potential for fruitful research on this subject. One option would be to estimate the fixed-costs of hours and days of work using a hedonic wage model. In doing so, we could arrive at estimates of the magnitude to which workers would have to be compensated to vary their hours/days combinations. This would give a good indication of the relative daily and hourly costs of

employment. A second option would be to use panel data to arrive at a better understanding of the shocks to individual utility functions that result in changes in hours and days for both job stayers and job changers. disaggregating weekly labour supply into its days and hours components is an important first step in analyzing a variety of policy questions. What is clear is that employees value flexible working schedules and some are willing to change jobs to achieve these.

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Utilization of Human Capital in the U.S., 1975-1992: Patterns of Foregone Potential Earnings Among Prime Age Males

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THE UTILIZATION OF HUMAN CAPITAL IN THE U.S., 1975–1992:
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Fundamental changes in labor market patterns among U.S. prime-age men over the past two decades have been the focus of numerous recent research studies and media accounts. Increases in wage inequality and in male joblessness are the most important of these changes; assertions of an increase in part-time and "contingent" work have also been made. In addition, there is evidence of a more general decline in the total annual hours of market work of the typical working-age male.[1]

In this paper, we focus on civilian non-student 18–64 year-old males, and present two new statistical indicators of the extent to which the human capital of this group (and subgroups within it) is **under**utilized. We call the first indicator **Foregone Potential Earnings** (FPE) and the second the **Capacity Utilization Rate** (CUR). Both of these indicators measure the extent to which the use of human capital falls short of a full utilization norm.

We view the human capital embodied in an individual (or a group) to be the value of the "bundles" of characteristics possessed by the person or group if used in productive economic activities. These characteristics include such things as schooling, skills, age, gender, race, and health status, among others. The independent effect of any one of these characteristics on the individual's observed (or estimated) wage rate is taken as an estimate of the market valuation of the hourly rental value of the characteristic. This framework implies that the economic value of an individual's

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[1]A December 1, 1994 front page New York Times story inquired, "So why are so many men—healthy men in the prime of life—working less than ever before?" ("More Men in Prime of Life Spend Less Time Working" by Sylvia Nasar). See also, Buron and Haveman (1995), Buron, Haveman, and O'Donnell (1995), Freeman (1994), Katz and Murphy (1992), Juhn (1992).

productive activities is reflected in the market-determined "use-value" of these characteristics.[2] Hence, the annual value of the human capital of an individual (or group) is the amount that could be earned were the productive characteristics of the individual fully utilized. We consider that an individual is using his human capital to capacity if he works full time-full year (FTFY), that is 52 weeks per year and 40 hours per week. Individuals who work less than FTFY are considered to be underutilizing their human capital. Those working FTFY or more are using their human capital at capacity; no credit is given for work in excess of 2080 hours per year, FTFY work.

We use the FPE and CUR to examine trends in human capital underutilization for the population of working-age males, and for various population subgroups, over the 1975–1992 period. We also examine trends in the reasons given for the failure to fully utilize human capital.

The paper is organized as follows. In Section I, we describe the pattern of hours worked among working-age males from 1975 to 1992. This section reveals a hollowing out of the annual hours of work distribution—a smaller share of male workers are employed from 1–2080 hours per year, while increasing proportions are either not working at all or working in excess of the full activity norm. In Section II, we describe the concept and estimation of the two labor utilization indicators that we employ in this study—FPE and CUR. Levels and trends in these indicators for the population of working-age males are presented. In Section III, the patterns of human capital underutilization, as measured by FPE and CUR, are discussed for all males. The reasons for the underutilization of human capital are allocated among a comprehensive set of categories, based on the reasons given by respondents for not working, or not working full time-full year. Patterns of human capital underutilization for specific demographic groups distinguished by race, age and education are

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[2]This convention implies that the returns to race and gender found in human capital studies reflect real productivity differences and not discriminatory treatment of these traits in the labor market.

compared in Section IV. A similar comparison for particularly vulnerable populations—low education, minority youths and older workers—is presented in Section V. Section VI. concludes.

I. HOURS WORKED TRENDS: 1975–1992

Figure 1 shows the trend in average annual work hours for the male working-age population over the 1975–92 period, as reflected in the March Supplement to the annual Current Population Survey (CPS).[3] Separate trends are also shown for whites and non-whites;[4] they indicate that the average non-white male works only about 80–85 percent of the annual hours of the average white male. For both racial groups, mean annual hours largely follow the business cycle; the severe dip in hours worked during the 1980–83 recession is of particular note. The figure also shows that the subsequent recovery failed to return mean annual work hours to its pre-1980s level for either racial

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[3]The standard method of calculating annual hours from the CPS is to multiply weeks worked in the last year by hours **usually** worked in a week. If reports of the latter correspond to modal hours, rather than mean hours, as seems likely, this estimate is incorrect. In this analysis, we adopt a different convention, and employ information on weeks worked part-time and hours worked last week in the estimation of annual hours for some individuals.

If an individual usually works full-time (i.e., at least 35 hours per week) and does not report working part-time in any week, then annual hours are estimated in the standard way as the product of weeks worked and hours usually worked per week. The same formula is used if an individual reports working part-time throughout the year.

However, individuals who usually work full-time but work part-time in some weeks (or who usually work part-time but work full-time in at least one week) are not asked for their hours during part-time (full-time) employment. To fill in this data gap for these workers, we use information on individuals who worked part-time in the last week (not year), but who usually work full-time. We regress hours worked by such individuals in the last week on race, age, education and usual hours/week and use the estimates to obtain a conditional expectation of the part-time hours/week of usually full-time workers. Annual hours are then calculated as the product of weeks worked full-time and hours usually worked per week, plus weeks worked part-time multiplied by the estimate of part-time hours. An analogous procedure is used to calculate the annual hours of individuals who usually work part-time but work full-time in at least one week.

[4]'Whites' refers to white, non-Hispanics; 'Non-whites' are all others.

group. Indeed, over the entire period, the trend of annual work hours is slightly negative for all working-age males, and for the two racial subgroups.

Table 1 gives the percentage of the sample in four annual hours-worked categories—0, 1-2079, 2080, >2080—for the paired recession years of 1975 and 1991, and the paired cyclical peak years of 1979 and 1989. If one accepts that working 2080 hours per year or more constitutes FTFY work, the share of male workers who are less than FTFY workers declined over the 1975 to 1991 period. The share of working-age males who work between 1 and 2079 hours per year decreased by about 6 percent over the paired recession years, and about 12 percent over the paired peak years. This decrease in the proportion of working males who are employed less than the 2080 hours norm runs counter to claims that the growth of part-time jobs have been replacing full-time work at a rapid pace.[5]

The share of workers just meeting the 2080 hour norm also fell over the paired recession years, but remained about constant over the paired peak years. The share of workers in the combination of these two categories, including all workers employed from 1–2080 hours per year, decreased by about 6 percent over both pairs of years.

The most noteworthy change is the 26 percent increase in the proportion of jobless males (those with 0 work hours) over the 1975 to 1991 period—an increase from 7.7 to 9.7 percent of the working age population. The share of workers employed more than the FTFY norm of 2080 hours is also of interest. For all of the years reported in the table, more than 25 percent of the male working-age population reports hours in excess of this full utilization norm. For both pairs of comparison years, the share of workers reporting hours of work in excess of 2080 hours increased about 6 percent.

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[5]The strong claims regarding the growth of part-time employment at the expense of full-time employment have also been challenged by Dupuy and Schweitzer (1995).

Over the sets of paired years that we have examined, there has been a hollowing out of the middle of the annual hours distribution, with an increase in the mass at both extremes. These hours worked trends suggest substantial shifts in labor supply and demand over the period. Although the pattern of changes in the mean and variance in male earnings have been extensively studied, including changes in the level and distribution of both wage rates and hours worked, the sources of the observed shifts remains little understood.[6]

II. THE CONCEPT AND ESTIMATION OF FPE AND CUR

A. The Concept

In this section, we describe our two indicators of human capital underutilization: FPE and CUR. Both of these measures are indicators of the extent to which human capital is underutilized. The FPE indicator is the **number of dollars** that an individual's earnings fall short of the amount that he could earn were he to use his human capital at capacity. The CUR indicator is the **ratio** of the individual's earnings to the level of full capacity earnings. (It should be noted that, in addition to recording different dimensions of underutilization, the two indicators move in opposite directions when the extent of underutilization changes: FPE increases with the extent of underutilization, while the CUR decreases.)

We consider an individual to be using his human capital at capacity if his working time is at or exceeds a level commonly accepted to be full utilization—namely, full time-full year (FTFY) work—and if he supplies his labor at a wage rate consistent with the productivity implied by his characteristics. We define the earnings associated with such full use of human capital as **potential earnings** (PE), and measure this value as the product of an individual's predicted wage rate and 2080

[6]See Bound and Johnson (1992), Burtless (1990), Haveman and Buron (1994), Karoly (1992), Levy and Murnane (1992), and Moffitt (1990).

hours (full time-full year work).[7] Individuals who realize less than this potential earnings level are taken to be underutilizing human capital; those whose earnings equal or exceed PE are taken to be fully utilizing human capital. Both FPE and CUR measure this underutilization by comparing an individual's **earnings** (E) with his potential earnings. In measuring individual earnings, we rely on a predicted earnings value as a proxy for actual earnings, and refer to this value as "earnings" in the subsequent discussion. This value is the product of the actual number of hours that the person works in a year and his predicted wage rate.[8]

For any set of working age males, *I*, we measure FPE as a per capita, or average, value; it is the absolute difference between per capita potential earnings and per capita earnings. That is:

$$FPE_I = \frac{\sum_{i \in I} \textit{Potential Earnings}_i}{\textit{Number } i \in I} - \frac{\sum_{i \in I} \textit{Earnings}_i}{\textit{Number } i \in I}$$

CUR utilizes the same two concepts of per capita earnings and potential earnings, but reflects the ratio of them rather than the absolute difference between them. In particular, per capita CUR is:

$$CUR_I = \frac{\sum_{i \in I} \textit{Earnings}_i \ / \ (\textit{Number } i \in I)}{\sum_{i \in I} \textit{Potential Earnings}_i \ / \ (\textit{Number } i \in I)}$$

So defined, both FPE and CUR measure the extent to which the utilization of human capital deviates from a socially-accepted norm of full capacity utilization; in this case, 2080 hours per year.[9]

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[7]Histograms with a bandwidth of 1 hour reveal a mode of 2080 hours in each of the peak and trough years examined.

[8]Our procedure for estimating the individual predicted wage rate, which is used for calculating both earnings and potential earnings for each individual, is described in Appendix I (also see footnote 3).

[9]Given this convention, underutilization indicators could be calculated by comparing the actual hours that individuals work to the full capacity work hours norm of 2080 hours. However, because

While labor market distortions may cause observed (and, hence, predicted) wages to be an imperfect measure of the productivity of an individual's work time, we accept these market values as the most appropriate weighting factor available for estimating the value of both earnings and potential earnings. We note that changes in labor market distortions over time will be reflected in the trend of aggregate measures of both earnings measures. For example, the presumed reduction in the influence of labor unions on wages (associated with the fall in union membership over the past two decades) could lead to a downward trend in both earnings and potential earnings due to a decrease in estimated wage rates. It should also be emphasized that the estimated wage rates used to weight actual and potential (2080) work hours reflect the interaction of supply and demand factors in individual markets at a point in time. Hence, individual potential earnings estimates can only be aggregated to indicate the total, or per capita, value of potential earnings under the assumption that the structure of wage rates would not change in any important way if all males were to increase their annual work time to 2080 hours, reflecting the full use of their human capital.

B. FPE and CUR of Working-Age Males

We begin our examination of FPE and CUR with Table 2, which shows the trends in various earnings measures for the civilian non-student 18–64 year old male population. Over the 1975 to 1992 period, aggregate real earnings[10] for the population of working-age males in the U.S. increased from $1.26 trillion to $1.47 trillion, or 17 percent. During this same period, the total male working-age population grew from about 52 million to about 69 million, or 32 percent. Hence, per capita

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we are interested in **human capital** utilization rather than **labor hours** utilization, we account for individual productivity as measured by the predicted wage rate in measuring both the earnings and the potential earnings components of our FPE and CUR indicators.

[10]Aggregate earnings is the sum of the individual earnings of working-age males, which we described above as the product of an individual's actual annual hours of work (see note 3) and the individual-specific predicted wage rate. Dollar comparisons are in 1993 prices throughout the paper.

earnings for working-age males fell by nearly 12 percent over the period, from about $24,000 to $21,000. This trend in average male earnings is shown in the first column of Table 2, and is consistent with other estimates of sagging mean earnings of male workers.

We estimate that over the same period, aggregate potential earnings of all working age males in the U.S. rose from $1.48 trillion to $1.77 trillion, an increase of 19 percent. However, because of the 32 percent growth in the size of the working-age male population over this period, per capita potential earnings fell from $28,206 to $25,494, a decrease of 9.6 percent. This is shown in the second column of Table 2.

By comparing the level of per capita earnings (column 1) to per capita potential earnings (column 2), we can measure the extent to which working-age males fail to utilize their stock of human capital.[11] Over the 1975 to 1992 period, the gap between aggregate earnings and aggregate potential earnings (aggregate FPE) increased from $.22 trillion to $.30 trillion, or 36 percent. In per capita terms, FPE increased by nearly 3 percent over the period, from $4201 to $4313 (Table 2, column 3). The final column of Table 2 shows the ratio of earnings to potential earnings, the capacity utilization rate (CUR); it fell from over 85 percent to 83 percent over the period, a decrease of 2.4 percent.

A regression of each of the four series in Table 2 on a time trend reveals average annual decreases of per capita earnings and potential earnings of $154 and $152, respectively. The average annual decrease in the CUR was nearly .1 percentage point per year, equivalent to a one percentage point decrease in CUR per decade. These findings indicate that the decrease in per capita earnings is the result of both a decrease in the level of potential earnings and a reduction in the proportion of potential earnings that are realized.

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[11]In estimating FPE and CUR—indicators of the extent to which human capital is less than fully utilized—annual work hours in excess of 2080 for individuals who exceed this full time-full year norm are ignored, and such workers are counted as having zero unutilized work hours and as working at capacity. Hence, both FPE and CUR are appropriately viewed as indicators of the **underutilization** of human capital.

The trend in the CUR shown in column 4 is erratic, and reflects changes in the macroeconomic performance of the economy. For example, the CUR decreased from nearly 87 percent in the peak year of 1979 to less than 82 percent in the recession of 1982.

To reveal the longer term trend in the CUR, we remove from the estimate of per capita potential earnings (the denominator of the CUR) the per capita potential earnings that were not realized because individuals are unable to find work, as revealed by each worker's own annual report of unemployment hours. The resulting ratio of per capita earnings to per capita potential earnings adjusted for unemployment hours reflects the trend in the CUR apart from changes in macroeconomic conditions.[12] We call this ratio "macro-constrained CUR," and interpret it as an indicator of the shortfall from the full utilization of human capital attributable to factors other than the macroeconomic performance of the economy.

Figure 2 displays the trends in the overall CUR, and in the "macro-constrained CUR". Over the period from 1975 to 1992, this adjusted CUR indicator decreased steadily from over 90 percent to about 88 percent. From this, we conclude that there has been a secular increase in the extent to which the male human capital stock is underutilized over the past two decades apart from macroeconomic trends.

III. FORGONE POTENTIAL EARNINGS: ALL MALES, 1975–1992

A. The "Prevalence" of FPE

One plausible indicator of the extent of labor underutilization is the percent of all working-age males who work less than the "full activity" norm, and hence record some level of FPE. This

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[12]An alternative view of macro-constrained CUR is the ratio of per capita earnings divided by per capita potential earnings less the per capita gap between these two values that is attributed by workers to unemployment, to their inability to find work. The latter term is the product of per capita annual reported unemployment hours and the predicted wage rate.

percentage of non-fully-active males was revealed in Table 1, and we use it here as an indicator of the "prevalence" of FPE.

In each of the recession years of 1975 and 1991, about 39 percent of working-age males recorded some amount of FPE (Table 1). However, comparing the late-1980s cyclical peak to the late-1970s peak suggests that the prevalence of FPE increased by about 2 percentage points over the decade.

We calculated the patterns of FPE-prevalence for four age groups, four education groups, and two race groups, for a total of 32 race-age-education groups.[13] Across age groupings, young males (18–24 years) have the highest prevalence of FPE—about 59 percent for whites and 66 percent for non-whites.

Males aged 55–64 years were the only age group to show an upward trend in FPE-prevalence over the period. This increasing trend in older work FPE prevalence holds for both racial groups and all education levels. Interestingly, within this older age group, the increase in FPE-prevalence is greater for the most educated groups, suggesting that the voluntary substitution of leisure for work time is greater for individuals in this higher income group than for other individuals. By 1992, FPE-prevalence for the oldest group approached that for the youngest. For non-whites about 62 percent of older workers worked less than full time-full year—and hence earned less than their potential—while the corresponding figure for whites was about 50 percent.

FPE-prevalence is the highest for the high school drop-out group, and has been increasing over time. The largest increase in FPE-prevalence among this low education group is recorded for white drop-outs, who ended the period with 62 percent of the group either jobless or working less

[13]The four age groups are 18–24, 25–39, 40–54, and 55–64. The four education groups are < 12 years, 12 years, 13–15 years, and 16+ years. The two racial groups are whites and non-whites.

than full time-full year (up from 52 percent in 1975). This recent rate is nearly as high as that for non-white drop-outs (65 percent).

Of the eight race-education groups, only non-white college graduates recorded a decline in FPE-prevalence over the period.

When FPE-prevalence is disaggregated into race-age-education groups, the youngest group of high school dropouts stands out. Irrespective of race, about 73 percent of 18–24 year old dropouts either have no employment over the course of the year or work less than FTFY. While this very high level of FPE-prevalence among youth dropouts remained constant over the period, FPE-prevalence rose rapidly for high school dropouts in all other age groups. This finding is at odds with the general perception that the young, least-educated—and, non-white—groups have experienced the greatest labor market **deterioration** in recent years.[14]

B. **FPE and CUR Among Those Not Fully Active**

Table 1 indicates that about 35–40 percent of working-age males were working less than the full time-full year norm during the 1975–1992 period. The disaggregated race-age-education patterns of working-age males with an "activity deficit" were described in Section III.A. However, these patterns of FPE-prevalence say little about the shortfall of earnings from potential earnings *for those with an activity deficit*. This shortfall—FPE—is measured by the gap between earnings and the potential earnings for the group of not-fully-active working age males, and can be summarized by the

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[14]Juhn (1992) reports that the decline in the labor market participation of black high school drop-outs over the 1967–87 period was most pronounced in the youngest group (that with the least labor market experience). A number of factors may explain why we do not find this. The principal difference between our analysis and that of Juhn is the measure of labor utilization. She examined weeks worked as a proportion of 52, while our results are based on whether the individual works less than 2080 hours. Further, the periods of analysis differ. Another important difference lies in Juhn's examination of blacks, as opposed to non-whites. It is plausible that there has been a decline in the labor market attachment of young black high school drop-outs which is not evident when all non-whites are taken together.

capacity utilization rate (CUR). This measure can be interpreted as the extent—or "intensity"—of FPE among those not fully active. In the following discussion, we summarize the most important CUR patterns for this less "than-fully-active" group; a more complete set of estimates is found in Buron, Haveman, and O'Donnell (1995).

Among this less-than-fully-active group (those with positive FPE), there has been a clear upward trend in the extent—or intensity—of human capital underutilization. The aggregate level of FPE increased during the early-eighties recession, failed to recover in the late-eighties, and increased again in the recession of the early-nineties. The CUR for those working-age males with an activity deficit decreased from .55 to .48 over the 1975–1992 period. This translates into an increase of unutilized work hours among this growing less-than-fully-active group from an annual average of 941 hours of inactivity to an annual average of 1090 hours—nearly 16 percent.

In contrast to our measure of FPE-prevalence—which was highest among the youngest age group—the lowest CUR among those who are not fully active is recorded for those aged 55–64 years. While young males are more likely to work less than 2080 hours than are males in the oldest group, the older males with FPE are more likely to be completely inactive, due to factors such as health, disability, and retirement.

For those not working at or beyond the full time-full year norm, the CUR has been decreasing for all age categories, and both racial groups. The decrease in the CUR among older whites over the past two decades has been greater than that of older non-whites, and suggests an increased propensity for whites to retire (or to at least reduce their work hours) prior to age 65 relative to that of non-whites. Because the CUR of non-whites in this older age category was less than that of whites, these differential trends indicate a narrowing of the race differential in human capital utilization for this older, less-than-fully-employed group.

However, the opposite trend holds for the group aged 25–39 years; for these prime-age workers, the racial gap in the CUR has been increasing as the utilization rate for non-whites who are not fully active has been falling faster than the CUR for whites. By 1992, non-whites in this prime age category who were either jobless or were working less than the full time-full year norm recorded earnings of less than one-half of their potential earnings; the comparable percentage for whites who are not fully active is about 60 percent.

A downward trend in CUR among the less-than-fully-employed is observed for all education groups. For whites, the difference in CUR across these education groups has remained roughly constant. In contrast, CUR has decreased most rapidly for the non-whites with the highest education levels, hence narrowing the gaps among education categories within this racial group. White high school dropouts who were not fully-active showed a more rapid decrease in their CUR over the period than did non-white dropouts—by the end of the period, the CUR among those not working full time-full year stood at about 35 percent for both of these low education racial groups.

C. **The Reasons for FPE**

1. Self-Reported Reasons for FPE

Table 2 shows that per capita real FPE has ranged from about $3,800 in 1978 to over $5,000 in the recession year of 1982. From respondents' answers to questions regarding why they work less than the FTFY norm, per capita FPE for each year can be decomposed into the following comprehensive set of "reasons." (Appendix II describes the decomposition method we have used.)

- Work is not available (unemployed)
- Discouraged from seeking work
- Illness/disability
- Retirement
- Voluntary part-time work
- Housework, including child care
- Other

The level and trend of these components of per capita FPE are presented in Figure 3 for the 1975–92 period. The vertical sum of the component values for each year equals per capita FPE.

With the exception of the late 1970s boom, a **lack of employment opportunities** for those seeking work is the largest component of FPE. On average, across the period, the unemployment reason for the failure to fully utilize human capital accounts for between 25 to 35 percent of FPE. This unemployment component peaks during the recession of the early 1980s, when it accounts for nearly $2,200 per person of FPE. The value of per capita FPE due to this job availability reason was at its lowest at the end of the expansion of the late-1980s, when it fell to less than $1000 per person. Over the period, per capita FPE due to unemployment shows a slight downward trend of about $120 per decade.[15]

The second component of FPE is labeled "**discouraged workers**," and it too reflects macroeconomic conditions. We calculated this component over nonworkers and those working part-year (but not part-time), and defined this value as earnings forgone by individuals in those categories who are not looking for work, and who do not give illness-retirement-housework reasons for not working. The value of this discouraged worker effect ranges from a low of about $100 per person (or about 2 percent of total FPE) during the high employment period at the end of the 1970s, to a high of nearly $400 (nearly 6 percent of the total) during the early-1980s recession. While this value declined during the expansion of the 1980s, it never fell below $200 per person, and rose to over $300 by the end of the period. Per capita FPE due to this discouraged worker effect showed an upward trend over the period of about $140 per decade.

Illness or disabling health conditions form the second most important reason for FPE, and accounts for a per capita value of about $1000 to $1300 per year over the period. The trend in FPE

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[15]This average annual change was again calculated by a regression of the values of the unemployment series in Figure 3 on a time trend.

due to this factor is clearly downward, however, at about $150 per person per decade. This downward trend in forgone earnings due to illness/disability contradicts a growing incidence of illness/disability problems among the working-age population reported in other studies.[16]

Retirement is the third most important reason for FPE, and has accounted for $500 per capita to nearly $1000 per capita. This source of FPE is the most rapidly growing among the set of reasons given by working age males for the failure to fully use human capital. Per capita FPE due to retirement has grown about $190 per decade, or nearly $350 over the 1975–1992 period.

The remaining reasons for FPE (**housework, voluntary part-time work, and other**) account for a relatively small share of total FPE per person—ranging from 14–23 percent of the total over the period. Aggregate FPE attributable to this set of reasons has crept up slowly over the period.

2. Voluntary and Involuntary FPE

The underutilization of human capital due to exogenous constraints placed on individuals carries quite different social and policy implications than that due to voluntary, individual choices. For this reason, we have divided per capita FPE into two components—that arising from **voluntary** reasons (retirement, voluntary part-time work, and housework) and that stemming from **involuntary** reasons for the underutilization of human capital (work not available, discouraged from seeking work, and illness).[17]

Figure 4 shows the level of per capita FPE due to voluntary and involuntary reasons for the working-age male population. An upward trend for voluntary reasons is observed; the trend for

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[16]See Chirikos (1986) and Colvez and Blanchet (1981).

[17]The attribution of FPE into "voluntary" and "involuntary" categories rests on a judgement over which people can disagree. For example, an individual may choose not to work, but may report illness (included in our "involuntary" category) in order to indicate a more acceptable reason for not working. The reason 'other' is excluded from these estimates. FPE per person due to voluntary reasons is expressed as a fraction of per capita FPE, excluding per capita FPE due to the 'other' category.

involuntary reasons is negative. At the beginning of the period, the ratio of voluntary to involuntary FPE was about 25 percent; by the end of the period, the ratio had risen to about 37 percent. Over the 1975–192 period, per capita FPE attributed to voluntary reasons **increased** by about $240 per decade, while per capita FPE due to involuntary reasons fell by about $130 per decade.

Figure 5 records the CUR that would result if the only reasons for failing to full utilize human capital were those we labeled "voluntary." It is obtained by dividing per capita earnings by the level of per capita potential earnings if there were no involuntary constraints on using human capital, as defined above.[18] From 1975 to 1992, the voluntary CUR decreased from more than 95 percent to about 93.5 percent; a reduction of about 1 percentage point per decade.

IV. FORGONE POTENTIAL EARNINGS PATTERNS AMONG RACE, AGE AND EDUCATION SUBGROUPS: 1975–1992

The overall patterns of working-age male human capital underutilization described above conceal substantial differences among race-age-education subgroups. In this section, we summarize a few of the more prominent of these differences.[19] We begin with a discussion of racial differences, and then present differences among age and education subgroups. In each discussion, we present subgroup patterns in the prevalence and intensity of FPE, and then explore differences among subgroups in mean FPE levels and trends, the reasons for FPE, and voluntary/involuntary FPE patterns.

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[18]This adjusted, or voluntary, CUR is defined as the ratio of per capita earnings to per capita potential earnings less per capita involuntary forgone earnings (earnings unrealized because work not available, discouraged from seeking work, and illness); that is,

Voluntary CUR = Earnings /(Potential Earnings - Involuntary FPE).

[19]Tables and figures describing the detailed sub-group patterns are available from the authors upon request.

A. Racial Differences in FPE

Figure 6 shows the time trend of per capita potential earnings for whites and non-whites from 1975 to 1992. Over this period, the ratio of non-white to white potential earnings fell from 73.7 to 70.6. The earnings potential of the mean white male fell by an average of $1104 per decade; that for the mean non-white male fell by $1188. As a result, the racial gap in potential earnings increased slightly over the period.[20]

The large and growing racial disparity in potential earnings reveals little about the utilization of earnings potential. The disparity between whites and non-whites in the **prevalence** of FPE—that is, in the percentage of working-age males who fail to work full time-full year—is substantial; about 35 percent of white males of working age have FPE in 1992, while the corresponding percentage for non-whites is 50. However, over the 1975–1992 period, the racial disparity in FPE-prevalence has narrowed slightly.

The racial difference in the **intensity** of labor utilization among those with FPE (per capita FPE among those who work less than the full time-full year norm) is also substantial, though less than the difference in FPE-prevalence. In 1975, non-whites with FPE failed to use about 1080 of their potential work hours, while whites with FPE left about 915 of their potential work hours unutilized. By 1992, both of these indicators had increased—to 1206 hours and 1020 hours, respectively. Hence, the racial gap between whites and nonwhites in FPE intensity widened slightly over the period.

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[20]The decreasing ratio of non-white to white potential earnings reflects the overall increase in wage inequality over the period. Because non-whites are concentrated at the lower end of the skill and potential earnings distributions, increased overall wage inequality is also reflected in increased wage and potential earnings disparities between racial groups over the 1975–92 period. Recall that potential earnings is the product of the individual wage rate and a constant (2080 hours).

Figure 7 shows the levels and trends of per capita FPE for all non-whites and whites.[21] In each year, the level of non-white FPE exceeds that for whites, even though potential earnings are substantially greater for whites than non-whites. Because the CUR captures the relationship of FPE to potential earnings, the CUR patterns of the two racial groups are presented in Figure 8. The CUR of non-whites is about 10 points below that of whites. Over the entire period, the CUR of non-whites averaged about 75 percent, compared to about 85 percent for whites. From 1975 to 1992, the CUR of both racial groups fell; the decrease in the non-white CUR (about 1.1 percentage points) was slightly greater than that for whites.

Table 3 shows 1975 levels of FPE for both non-whites and whites, along with the reasons for FPE in that year, and the voluntary/involuntary breakdown in the causes for FPE. It also summarizes trends in all of these categories expressed in "dollars of average per decade change" over the 1975 to 1992 period.

The most striking pattern is the **decline** in per capita FPE for non-whites over the period, in contrast to virtually no change in per capita white FPE. The difference in the "per decade change" figures implies that the racial gap in the FPE indicator of labor underutilization narrowed by nearly \$240 over the 1975–1992 period—or by over one-fifth of its initial level of about \$1170.[22]

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[21] As before, FPE is calculated over both individuals who work less than the full time-full year norm and those who work 2080 hours or more; those in the latter group are assigned zero FPE.

[22] Interestingly, although the racial gap in FPE (or unutilized potential earnings) decreased over the period, the racial disparity in potential earnings increased. Over the 1975 to 1992 period, per capita potential earnings of non-whites decreased \$1,188 per decade, while the potential earnings of whites decreased by about \$1,104 per decade. However, while per capita earnings of whites decreased by about \$1,110 per decade, those of non-whites decreased by a smaller \$1,050 per decade. (This decrease in per capita non-white earnings is about .6 percent per year; that for whites is a smaller .4 percent per year.) The lower decrease of non-white earnings (relative to white earnings) along with the larger decrease in non-white potential earnings is offset by a smaller decrease (or an increase) in non-white hours worked as compared to those by whites. (Recall the slight narrowing in the racial gap in FPE-prevalence). Hence, while per capita FPE for whites remained about constant over the period, that for non-whites fell.

While the contribution of unemployment to FPE showed a downward trend over the period for both racial groups, the decrease in the unemployment reason for FPE was larger for non-whites than for whites. By the FPE measure of underutilization, then, the failure of the economy to perform at full employment took a smaller toll on non-whites (relative to whites) at the end of the period than it did at the beginning.

FPE due to being discouraged from seeking work is quantitatively small relative to FPE due to unemployment. However, this discouraged worker FPE was three times larger for non-whites than for whites at the beginning of the period, and increased at twice the amount for non-whites relative to whites over the period. Whether or not non-whites (relative to whites) are, in fact, working fewer hours because they are discouraged about the possibility of finding a job, their reports of the reasons for non-work indicate that they believe that this is an important source of their failure to work full time-full year.

For both racial groups, a large share of the decrease in capacity utilization is attributable to the increase in pre-age-65 retirement. Per capita "early" retirement FPE for whites was double that for non-whites at the beginning of the period, and increased more rapidly over the period. Primarily because of the more rapid growth in FPE due to retirement for whites, Voluntary FPE grew more for whites over the period than for non-whites.

Surprisingly, when contrasted to the large racial gap in the overall CUR (about 85 percent for whites and 75 percent for non-whites), the Voluntary CUR was only slightly lower for non-whites than for whites over the entire period. Not only may exogenous (or nonvoluntary) factors play an important role in understanding the overall labor market performance and level of living differences among whites and non-whites, these factors also appear to play the main role in explaining white/non-white differences in the underutilization of human capital. The CUR attributable to voluntary reasons fell by about 1.6 percentage points for both groups over the period.

B. **Age Differences in FPE**

Figure 9 is the analogue of Figure 6, and shows the time trend of per capita potential earnings for the four age groups. The most interesting patterns are for the youngest (ages 18–24) and oldest (ages 55–64) groups. Per decade, the earnings potential of 18–24 year olds fell by $2700, while mean potential earnings of older working-age males decreased only $960. Over the entire period, the ratio of the potential earnings of the youngest group to that of the oldest group fell from 63.6 to 51.6—a radical drop of 12 points.

Young working age males have a higher FPE-prevalence than do the older males, but the difference has narrowed over the period. In 1992, about 61 percent of the youngest group failed to work FTFY, as compared to 55 percent for older workers—a difference of 6 percentage points. In 1975, the corresponding figures were about 60 percent and 47 percent, which yields a gap of 13 percentage points.

The **intensity** of labor utilization, as measured by the extent of FPE among those not working FTFY, also differs substantially between the young and older age groups. By the end of the period, 73 percent of potential earnings were forgone by the older male group with FPE; this is equivalent to the use of only 560 of the available 2080 hours associated with full time-full year work for these workers. This compares to about 46 percent of potential earnings unrealized for youths who are not working full time-full year. For both groups, the percentage of potential earnings forgone (among those with FPE) has drifted up over the period, by 8 percentage points for the older group and 3 percentage points for the younger group.

The trends in overall FPE and CUR for the two age groups are shown in Figures 10 and 11. FPE is higher for the older group than for the younger group, which is not surprising given the substantially higher potential earnings of the older group. Moreover, the old-to-young gap has been

rising over time. Interestingly, per capita FPE for youths has **decreased** slowly by about $700 over the 18 year period, while per capita FPE for the group of older workers has risen by over $2,000.

Consistent with this pattern, the per capita CUR of youths has drifted downward from the high 70 percent range to the middle 70 percent range over the period, equivalent to a fall of about 1.5 percentage points per decade over the period.

A quite different picture is seen for the older group. The trend in the per capita CUR for the older group has fallen from about 73 percent at the beginning of the period to about 65 percent by 1992. This translates into an average per decade decrease of about 5 percentage points in the CUR of older, but working-age men.

Table 4 summarizes the differences in the reasons for FPE and voluntary/involuntary patterns of FPE between young and older working-age men, as well as trends in these patterns. Several patterns are worthy of note. While the level of FPE is high for both older and younger workers, it has moved in quite different directions over the 1975–1992 period. For youths, FPE has fallen by nearly $400 per decade, driven by a decrease of more than $500 per decade in FPE attributable to reduced unemployment-generated nonutilization. This decreasing toll in the effect of shortfalls in macroeconomic performance on youths is unexpectedly large. The very large increase in FPE for the older age group—$1,130 per decade—is more than explained by the rapid increase in retirement over the period; an additional $1,562 of potential earnings was lost each decade of the period because of retirement decisions among this older group.

Interestingly, the retirement-induced increase in FPE for this older group was offset by a substantial decrease in the amount of forgone earnings due to illness/disability; from an average of about $3,000 per year in FPE at the beginning of the period, to about $2,200 by the end of the period. Apparently, a growing fraction of older workers who report having not worked and utilized

their human capital because of health problems have, in recent years, recorded retirement as the reason for not working.

For youths, the sizable increase in FPE due to the discouraged worker effect is disturbing. Over the course of the 18 year period, average FPE increased about $350 due to this effect, a two-fold increase over the period. This compares to the surprising reduction in the effect of unemployment on youth work effort, noted above.[23]

These patterns indicate a substantial increase in voluntary FPE among older workers, with a smaller, but perhaps more troubling, increase in the voluntary nonuse of human capital for youths. Over the period, the voluntary CUR fell by about 1.8 percentage points for youths, and by nearly 13 percentage points for older workers. For both groups, voluntary CUR was substantially below that of the entire male work force during this period.

C. Education Differences in FPE

In Figure 12, the pattern of potential earnings over the 1975–1992 period is shown for the four education groups. Noteworthy levels and changes are seen in the two lowest education groups—dropouts and those with a high school degree (but no college). Over the 18 year period, potential earnings for the high school or less group fell from about $25,000 to about $19,000. The average per decade decrease in potential earnings is $4,265 for dropouts, and $3,571 for high school graduates. Of the four education groups, only college graduates showed an increase in potential earnings over the period. The increasing return to years of schooling is clearly seen in the widening gap in potential earnings among these education groups.

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[23]One possible reason for the opposite movement in these reasons for underutilization may lie in the definition of the discouraged worker category. The level of voluntary choice reflected in the answers to the questions from which the discouraged worker category is constructed is unknown.

The two low schooling groups have a substantially higher level of FPE-prevalence than do males with at least some college education. At the beginning of the period, only 45 percent of the dropouts were working full time-full year. By 1992, this percentage had fallen to 37 percent. A high proportion of the high school graduates also have unutilized labor market capacity. In 1975, only 60 percent worked full time-full year, and this decreased slightly to 57 percent by 1992. For comparison purposes, nearly 70 percent of those with at least some college worked at least full time-full year over the period, and this percentage increased slightly.

Individuals with some FPE in these two low schooling groups also show a low **intensity** of labor utilization over the period. For all high school dropouts with FPE, the proportion of potential earnings that is *not* realized increased from 53 to 64 percent from 1975 to 1992. By 1992, the average dropout worked only about 750 of the full time-full year norm of 2080 hours. For those with a high school degree (but no more), the percent of potential hours forgone increased from 42 to 48 over the period. By 1992, the typical high school graduate realized only about one-half of his potential earnings because of this low level of annual work hours.

Figures 13 and 14 show the trends in overall per capita FPE and CUR for these two low schooling groups. Taken separately, per capita FPE for the high school dropouts decreased slightly over the period—by about $80 per decade (Figure 13)—while FPE for those with a high school degree increased about $200 per decade. However, because of the large decrease in potential earnings for both of these groups, the CUR for both of these two groups fell dramatically over the period. The CUR for high school dropouts fell from about 74 percent in 1975 to about 62 percent by the end of the period, while the CUR for the group of those with just a high school degree fell from 86 percent to 79 percent (Figure 14).

The reasons for per capita FPE and the voluntary/involuntary designation of these reasons are shown in Table 5 for the dropout and high school degree groups. The reasons for the level of and

change in FPE for these low education groups are dominated by unemployment, discouragement over finding work, and illness. Earnings forgone due to unemployment decreased for both low education groups over the period. However, per capita FPE due to the discouraged worker effect increased by $264 per decade for the group of dropouts, and by nearly $100 per decade for those with a high school degree. A large increase in underutilization due to retirement is also recorded for both groups.

The voluntary CUR for the high school dropout group decreased by about 3.6 percentage points per decade—from about 93 percent to about 86 percent over the period. For the group with a high school degree, the voluntary CUR decreased from over 95 percent to about 93 percent over the period. By contrast, the voluntary CUR for the groups with some college education stood at nearly 95 percent by the end of the period.

V. FORGONE POTENTIAL EARNINGS PATTERNS FOR VULNERABLE GROUPS: 1975–1992

The patterns discussed in Section IV. reveal substantial variation in human capital underutilization among subgroups of the male working-age population. In general, non-white youths and older males—especially those with low schooling levels—have the highest levels of underutilization. These same groups display the largest increases in human capital underutilization over time.

In this section, we use our FPE and CUR indicators to explore labor market patterns for the most vulnerable of these subgroups. We focus on the youngest and oldest **non-white** groups with the **lowest schooling levels**, and compare their patterns with those of the average male in their age group, and with the average working-age male, irrespective of age.

Table 6 shows these patterns for non-white youths with low schooling levels, all youths, and all males. Table 7 presents the same patterns for non-white older males, all older males, and all males.

A. Low Education Minority Youths

Consider, first, low education minority youths (Table 6). Although the top row of the table, Potential Earnings, reveals nothing about the utilization of human capital, it shows vividly the declining prospects of low education minority youth. Over the 18-year period, real potential earnings fell by 16 percent per decade for both non-white youths who dropped out of high school and those with a terminal high school degree. This compares with a 15 percent decadal drop for all youths, and a 5 percent drop for all males.

For both low-education groups of minority youths, FPE fell over the period. However, the decrease in FPE must be interpreted in the context of a decreasing level of potential earnings. The ratio of per capita earnings to total potential earnings—the CUR—fell over the period for both low education minority groups—by over 3 percentage points for the dropouts and 4 percentage points for the terminal high school graduates. By way of comparison, CUR fell by about 2.7 percentage points for all youths, and by 1.6 points for all males.

The primary reasons for FPE among low education minority youths, relative to all youths and all males, are revealing. For all of the groups, unemployment accounted for the largest portion of unused earnings potential. However, discouragement over finding work and illness accounted for a much larger share of FPE for the minority youths than for all youths. For all of the groups, voluntary FPE increased over the period. However, the voluntary CUR—the indicator of labor utilization attributable to reasons classified as "voluntary"—was substantially lower for the low education minority youths than for either all youths or all males. Most significantly, the fall in the voluntary CUR over the period was greater for minority, low-education youths than for either of the

comparison groups. Indeed, the CUR attributable to voluntary reasons for non-work decreased by nearly 4.5 percentage points over the 1975–1992 period for young minority dropouts.

B. **Low Education Minority Older Males**

Potential earnings decreased substantially for low education minority older workers, relative to both all older working-age men, and all males (Table 7). Over the period, potential earnings for low education older minority males fell by 9 percent (dropouts) and 6 percent (high school graduates) per decade, while the decrease was 3 percent for all older workers, and 5 percent for all males of working age.

Similarly, our indicator of the underutilization of human capital—FPE—is very high for low education minority, older males, relative to their earnings potential. At the beginning of the period, the CUR for these groups was only about 60–65 percent compared to 73 percent and 85 percent for all older workers and all males. However, as compared to low-education minority youths, FPE for the older, low-education minority workers rose substantially over the 1975–1992 period. This is reflected in the very large decreases in the CUR for the minority older males with low schooling. Over the 18 year period, the CUR for dropouts fell by nearly 10 percentage points (from an already low base of about 60 percent), while the CUR for terminal high school graduates decreased by 15 percentage points (from a base of about 68 percent). For all older workers, the CUR decreased by about 9 percentage points; it fell by only 1.6 percentage points for all males.

The reasons accounting for FPE among non-white, low-education, older males are dominated by unemployment, retirement, and illness. For both groups (and for all older males), illness is the single largest reason for FPE; in 1975, it accounted for nearly two-thirds of FPE for the dropout group, and 40 percent of FPE for the older workers with a terminal high school degree.[24] For the

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[24]Surprisingly, the dropout group reported that FPE due to retirement in 1975 ($770) was less than 20 percent of FPE due to illness ($4616).

dropout group, FPE attributed to illness declined over the period, as it did for the two comparison groups. For all of the older groups, retirement accounted for an increasingly large share of FPE over the period, while unemployment as a reason for FPE declined. It is noteworthy that non-work due to the discouraged worker effect accounted for very little of FPE for the non-white, low schooling older group at the beginning of the period; however, this source of FPE grew rapidly over the period for this vulnerable population.

Largely because of the increase in retirement, voluntary FPE grew for all of the older groups. This growth, in combination with the decrease in potential earnings, caused the voluntary CUR for low-education minority older males to fall substantially over the period—by 14–16 percentage points for the two low schooling groups, as compared to decreases of 9 percentage points for all older males and 1.6 percentage points for all males. By 1992, then, the voluntary CUR for the two minority groups had fallen to about 70 percent from its start-of-the-period level of over 85 percent.

VI. SUMMARY AND CONCLUSIONS

In this paper, we have defined a new indicator of the level of human capital, potential earnings, and two new indicators of labor underutilization, forgone potential earnings (FPE) and the capacity utilization ratio (CUR). We have used these concepts to assess the levels and trends of both the aggregate value of human capital and its utilization among U.S. working-age males from 1975 to 1992. For an individual, FPE is the gap between the norm of full time-full year work and the hours a person actually works, weighted by his predicted hourly wage. We measure this value in 1993 dollars and interpret it as the amount of potential earnings that the individual forgoes. CUR is the ratio of the individual's actual earnings (hours times the predicted wage) to the individual's level of potential earnings, and is interpreted as a rate of human capital utilization.

In Appendix III, we summarize the most salient among the numerous findings presented in this paper. Overall, the time related patterns in both potential earnings and the utilization of this potential (as characterized by FPE and CUR) indicate that the utilization of the stock of male human capital has been eroding over the period. This downward trend has been concentrated among very young and old workers, those with the lowest education levels, and non-whites.

This overall pattern raises the question of the extent to which the reduction in human capital utilization has been *"voluntary"* or *"involuntary";* i.e., whether it stems from changes in peoples *choices* or in the *opportunities* they face. For the entire male, working age population, the reasons for not using human capital were aggregated into voluntary (retirement, voluntary part-time work, housework) and involuntary (unemployment, discouraged from work, illness/disability) reasons. An upward trend for voluntary reasons is observed, while the trend for involuntary reasons is negative. At the beginning of the period, the ratio of voluntary to involuntary FPE was about 25 percent; by the end of the period the ratio had risen to 37 percent. Over the 1975 to 1992 period, per capita FPE attributed to voluntary reasons **increased** by about $240 per decade, while per capita FPE due to involuntary reasons **fell** by about $130 per decade, despite the increase in the discouraged worker component.

Our calculations allow an even deeper assessment of these voluntary/involuntary sources of human capital underutilization among certain age/race/education subgroups. In Tables 8 and 9, we present a variety of indicators of both types of sources for the entire population of working-age males, and for selected subgroups.

Table 8 presents three indicators of the **involuntary** causes of underutilization for all males of working age, and for the subgroups, these are interpreted as reflecting demand side opportunities. They are:

- the percentage change in involuntary FPE per decade,

- the percentage change in the percent of potential earnings available after accounting for losses attributable to involuntary reasons per decade[25], and
- the percentage change in FPE prevalence per decade.

Three indicators of **voluntary** reasons for underutilization, reflecting supply side choices, are shown in Table 9. They are:

- the percentage change in voluntary FPE per decade,
- the percentage change in the rate of capacity utilization attributable to voluntary reasons per decade,[26] and
- the percentage change in the ratio of voluntary to involuntary foregone earnings per decade.

Consider first Table 8, showing "opportunity" related—or involuntary—reasons for the underutilization of human capital. Overall, potential earnings decreased by 5.4 percent per decade over the 1975–1992 period. This indicator reflects the overall strength of labor demand, and its decrease over time is consistent with the stagnation of the average real wage. Percentage decreases of potential earnings in excess of this average are recorded for non-whites, both of the younger age groups, all of the education groups save college graduates, and for all of the vulnerable groups of nonwhite, low education workers. The percentage decreases of non-white, low education workers exceed 15 percent, about three times the average percentage decrease. To the extent that changes in our potential earnings variable reflect changes in the strength of labor demands, the pattern suggests lagging earnings opportunities, with the largest erosion targeted on those groups with the lowest earnings potential. The 5 (of 14) subgroups with reductions greater than 10 percent all have lower

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[25]This rate is equal to {1-[(FPE attributable to the unemployment, discouraged from work and illness reasons)/potential earnings]}*100. It is interpreted as the percentage of an individual's potential earnings that is available after involuntary losses of potential earnings are accounted for.

[26]This rate is equal to {1-[(FPE attributable the retirement, housework, voluntary part-time work and other reasons)/(potential earnings less FPE attributable to the unemployment, discouraged from work and illness reason)]} * 100. The denominator is interpreted as the level of potential earnings available after involuntary losses of potential earnings are accounted for. The fraction is interpreted as the percentage of the remaining potential earnings the individual chooses to forego voluntarily. The rate is thus the percentage of the remaining (or available) potential earnings the individual chooses to realize.

than average 1975 potential earnings. The mean potential earnings ranking of these 5 is 10.8 (out of 14).

Given the importance of the unemployment and discouraged worker causes of involuntary FPE, the demand side source of human capital underutilization is likely to be reflected in this indicator. Overall involuntary FPE fell by about 4.4 percent per decade, suggesting increased work opportunities. The pattern of involuntary FPE changes across the subgroups is disparate, and revealing. The groups showing increases in constrained work opportunities are the groups with the highest potential earnings—those in the prime age categories and those with the most education. The five subgroups with increases in involuntary FPE have an average potential earnings rank of 4.8 (out of 14). Most of the subgroups with the lowest potential earnings show **reductions** in the loss of potential earnings due to involuntary reasons.

Perhaps the most convincing indicator of the change in opportunities over the period is the change in the rate of **available** potential earnings. Erosion in this rate indicates an increase in the share of potential earnings that is lost because of involuntary—mainly, macroeconomic—reasons. Overall, the rate of available earnings has remained nearly constant, decreasing by less than .1 percent per decade. However, important differences across the subgroups are recorded.[27] Among age groups, only the oldest group (55–64) showed an increase in this rate (1.6 percent per decade). Among education groups, all showed decreases in this measure, with high school dropouts showing the largest percentage decline (5.2 percent per decade). The most vulnerable groups all showed decreases in the rate of available potential earnings, reflecting decreased *opportunities* for earnings available to these groups, in the face of nearly constant overall work opportunities. The potential

[27]While the overall percent per decade change in the rates of available potential earnings is negative, those for whites and non-whites separately are both positive. This arises from the increasing proportion of non-whites in the population over time, who experienced a smaller upward trend in this rate than did whites.

earnings rank of the six subgroups with more than a 1 percent per decade reduction in this rate is 8.8 (out of 14).

In sum, small involuntary—or opportunity-related—reasons for the underutilization of human capital are in evidence in each of the indicators shown in the table, with substantially higher effects on those groups with the lowest levels of potential earnings: non-whites, workers with a high school education or less, young workers, and especially the various age/race/education intersections of these groups.

Table 9 presents "choice"-based reasons for human capital underutilization. The first indicator in this table is the percent decadal change in the Voluntary CUR. Overall, per capita Voluntary CUR shows a small downward trend of about 1 percent per decade. A similar slowly declining trend is apparent for most of the demographic subgroups. For the oldest working-age males, however, Voluntary CUR fell substantially: over 8 percent per decade for 55–64 year olds as a whole, and for older, non-white high school dropouts and graduates. Those with low education and, especially, non-white youths with a high school degree or less also show high rates of decrease of Voluntary CUR.

The second indicator shown is the percent decadal change in voluntary FPE. Overall, voluntary FPE increased by over 35 percent per decade. Of particular note is the substantial increase for the oldest age groups which also had the largest initial levels of voluntary FPE. The initial level of voluntary FPE for the group of 55–64 year olds is $2,740 per capita; this high level increased by 62 percent per decade. The largest rates of increase in this indicator of voluntary nonutilization are for non-white and older workers, especially those with low education.

A summary measure of the relative importance of choice (voluntary) and opportunity-based (involuntary) reasons for foregone earnings is shown in the last two columns of Table 9: the ratio of voluntary to involuntary FPE, and the percent decadal change in this measure. Overall and for all of

the subgroups, the ratio of voluntary to involuntary reasons for FPE increased rapidly over the 1975–1993 period. For all working-age males, the percent decadal change in the ratio is nearly 50 percent. For the oldest individuals, the ratio increased by twice that amount: 95 percent. Decadal increases in this ratio in excess of 60 percent are also recorded for non-whites in general, and for non-white youth dropouts.

In conclusion, this paper has highlighted some interesting and important changes in the structure of the U.S. economy over the past 20 years. Overall, working-age males in the United States are facing somewhat reduced *opportunities* for securing earned income, as well as voluntarily *choosing* to earn less. The contribution of voluntary reasons for the increasing underutilization of human capital dominates that of involuntary—or opportunity—based reasons. These changes have been most dramatic for certain population subgroups. Individuals with the lowest education, particularly minorities with the lowest education, have experienced the largest decrease in labor market opportunities: they have the largest relative increases in involuntary FPE (relative to all working-age males), and the largest relative decreases in involuntary capacity utilization. The oldest working-age males and young minority dropouts have had the largest relative increases in voluntary FPE and the largest relative decreases in voluntary capacity utilization.

APPENDIX I

Estimation of Individual Predicted Wage Rates

Here, we describe the procedures adopted for obtaining individual predicted wage rates for each individual in each year. Since we seek a measure of marginal productivity in the labor market, we use data on only wage and salaried workers in our estimation. We eliminate the self-employed in our estimation because their earnings are some combination of returns to labor and capital that cannot be disentangled with CPS data.

In estimating an hourly wage function appropriate for predicting the wage rate for all males, we face the problem of unobserved wage rates for individuals who are not working. The potential bias induced by estimating a wage function from data on workers alone is dealt with by the standard selectivity correction (Heckman: 1976, 1979). The estimated coefficients in a probit model of employment status are used to generate predicted Inverse Mill's Ratios which are used to correct for selection bias in the wage equation estimated over workers alone.

The first stage, then, is a probit estimation in which the dependent variable is 1 if the individual worked during the year and zero if he did not. The explanatory variables are: a dummy variable for married spouse present, a dummy variable for the presence of unmarried children under age 18, the number of people in the family, non-labor income (defined as family unearned income less Social Security payments to the individual, less Public Assistance to the family, less pension payments to the individual, less child support and alimony payments to the family, less Supplemental Security Income to the family, less Worker's Compensation and unemployment insurance payments to the individual) , years of education and its square, years of experience (defined as age - education - six) and its square, the product of years of experience and years of education, a dummy variable for veteran status, a dummy variable for SMSA central city residence, a dummy variable for SMSA non-central city residence, dummy variables for northeast, south, and west, and the unemployment rate.

Although self-employed workers are excluded from both stages of the estimation, the resulting coefficients are used to estimate wage rates for the whole sample, including the self-employed.

The empirical specification of the hourly wage equations was arrived at by sifting the CPS to identify those variables which are both non-endogenous determinants of market productivity and recorded in every CPS year from 1976–93. The variables included are those used as explanatory variables in the first stage probit model of employment status, with the exception of exogenous non-labor income and the state-specific unemployment rate. The state-specific unemployment rate was initially included in the wage function but was found insignificant. (All testing for appropriate empirical specification was undertaken using 1976 data.) Likelihood Ratio tests indicated that the family composition variables—marital status, number of children, any children = 1, and number of persons in family—could not be excluded from the wage functions. Their inclusion is justified by the observation that they affect investment in job specific human capital, and hence are valid proxies for productivity.

The null hypotheses of no structural differences in the determination of the employment status and wages of the two racial groups were tested by Likelihood Ratio and Chow tests; both tests indicated rejection of the hypotheses at the 1 percent level using the 1976 CPS data. (Likelihood Ratio tests were used to test for structural differences in the probit models of employment status, and Chow tests for the wage equation. A Wald test, which allows for the possibility of differences between the variance of the disturbances of the two regression equations, was also used with no inconsistency with the Chow test results.)

On the basis of these results, separate wage functions were estimated for whites and non-whites in every year. (A dummy variable for Hispanic ethnicity was included in the both stages of the non-white estimates.) The parameter estimates for the two race-specific wage functions for each

year are available from the authors, as well as the probit equations that provide the basis for the required Inverse Mills Ratios.

The race-year specific coefficient estimates are used to predict each person's hourly wages based on their values for each of the attributes in the wage function. The predicted wage rate is multiplied by 2080 hours (the norm for full-time, full-year work) to arrive at potential earnings for each person in the sample. If a person works less than 2080 hours, forgone potential earnings is calculated by multiplying 2080 hours less actual work hours by the predicted wage rate. Hence, forgone potential earnings can be thought of as weighted forgone hours (hours worked less than the norm), where the weight is based on an estimate of the value of the person's productive capabilities in the labor market. If a person works 2080 hours or more, by definition, they are working at their full potential in the labor market, and hence have no forgone potential earnings.

APPENDIX II

Attribution of Forgone Work Hours to Reasons

Allocation of forgone work hours to the seven reasons that we have distinguished—no (full-time) work available, discouragement from finding work, illness/disability, retirement, voluntary part-time work, housework, other—was made as follows.

First, forgone work hours were split into hours per week and weeks deficits as described in Appendix I. These separate components were then allocated to the seven categories.

In the CPS, civilian adults who have worked between 1 and 49 weeks inclusive (1 ≤ CPS variable **wkslyr** ≤ 49) are asked how many weeks they were not working, but were looking for work (**wkslkun**). This amount multiplied by 40 hours is attributed to the "unemployment" reason for forgone hours. These workers were then asked what they were doing for most of the remaining weeks of the year. The set of potential responses was: illness/disability, taking care of home/family, retired, no work available, other. Given that these workers had already indicated how many weeks they spent looking for work, any worker responding "no work available" had these remaining hours (52 - **wkslyr** - **wkslkun**) * 40 allocated to the discouraged worker effect. Other responses had these hours allocated as indicated. If an individual worked more than 49 but less than 52 weeks, no inquiry is made as to what the person did in the remaining weeks. These forgone hours are included in the "other" category.

Civilian adults who did not work at all are also asked how many weeks they were in the labor force looking for work (**wksnw**). These hours (**wksnw** * 40) are attributed to the unemployment reason for forgone hours. These workers were then asked the reason for not working (**rnowrk**). The set of potential responses was: illness/disability, taking care of home/family, could not find work, other. Given that these workers had already indicated how many weeks they spent looking for work,

any worker responding "no work available" had these remaining hours (52 - **wkslkun**) * 40 allocated to the discouraged worker effect. Other responses had these hours allocated as indicated.

Individuals who report working part-time for at least one week in the last year are asked for the main reason for doing so. Only four response categories are available: i) could only find part-time, ii) wanted part-time, iii) slack work/material shortage, iv) other. In order to allocate forgone hours arising from part-time work to our six categories, we supplemented the information on reason for working part-time last year with information available from current economic activity status, reason for working part-time in the last week (if they usually worked part-time), and reason for working part-year.

Specifically, if an individual's reason for working part-time last year was i) or iii) above, their forgone hours due to part time work were allocated to the "no (full-time) work available" category. If their response was ii), and, even if they worked part-time last week and reported usually doing so, they did not give 'illness' or 'housework' as their reason, and if their current activity was not housework, and if they did not give 'illness' or 'housework' as a reason for working part-year, then they were allocated to the "voluntary part-time" category. If their response was ii) or iv) and they reported working part-time in the last week and usually did so and gave illness (housework) as the reason for this, or if they gave illness (housework) as the reason for working part-year, then their part-time forgone hours were allocated to "illness" ("housework"). If their response was ii) or iv) and their part-time hours had not yet been allocated, they were included in "other".

If an individual usually works less then 40 hours per week but at least 35, they are not asked why they did not work 40 hours. The part-time hours of individuals in this group were allocated to the "other" category. If an individual usually worked more than 40 hours per week, but worked less than 2080 hours over the year as a consequence working for only part of it, a negative number of

forgone hours, equal to 40 less their usual hours/week multiplied by the number of weeks worked, was included in the "other" category.

APPENDIX III

Summary of Empirical Findings

This appendix summarizes the most salient of our findings first for the entire civilian, non-student male working-age population, and then for important race, age, and education subgroups of their population.

Aggregate Male Human Capital and its Utilization

Over the 1975 to 1992 period, the share of working-age males who work less than full time-full year (about 35–40 percent of working-age males) increased, primarily as a result of the increase in the proportion of males that do not work at all during the year. Full-year joblessness increased a remarkable 26 percent between 1975 and 1991—from 7.7 to 9.7 percent of the working-age population. In addition, the share of workers reporting hours of work in excess of 2080 hours also increased further augmenting the hollowing out of the center of the hours worked distribution.

Aggregate real earnings for this group increased from \$1.26 trillion to \$1.47 trillion, or 17 percent between 1975 and 1992. However, because the number of working-age males grew by 32 percent over this period, per capita earnings fell by nearly 12 percent, from about \$24,000 to \$21,000.

Over the same period, the potential services from the stock of human capital, or aggregate potential earnings, of working age males in the U.S. rose from about \$1.5 trillion to over \$1.75 trillion, a 19 percent increase. However, on a per capita basis, potential earnings fell from about \$28,000 to \$25,500, a decrease of 9.6 percent. The decrease in per capita earnings was 2.4 percentage points larger than the decrease in potential earnings, indicating the utilization of the stock of male human capital has been decreasing over the period.

Indeed, the aggregate gap between earnings and potential earnings—FPE—increased during the early-eighties recession, failed to recover in the late-eighties, and increased again in the recession

of the early-nineties. Over the entire period, FPE increased by 36 percent, from about $220 billion to nearly $300 billion. Hence, by 1992, the level of unutilized male human capital stood at about 5 percent of the nation's GDP. In per capita terms, FPE increased about 3 percent over the period, from $4200 to over $4300, and the capacity utilization rate (CUR) fell from over 85 percent to 83 percent.

Sources of Underutilization of Human Capital: All Males

The level of FPE was broken down into the self-reported reasons for not working full time-full year. A **lack of employment opportunities** (primarily unemployment) is the largest component of FPE, and accounts for between 25 to 35 percent of FPE in each year. During the recession of the early-1980s, the lack of jobs accounted for lost potential earnings of nearly $2200 per person; by the end of the expansion of the late-1980s, lost potential earnings due to this reason fell to less than $1000 per person. Over the period, per capita FPE due to unemployment decreased slowly by about $120 per decade.

Illness or disabling health conditions form the second most important reason for FPE, and accounts for a loss of potential earnings of about $1000 to $1300 per person per year over the period. The trend in FPE due to this factor is clearly downward, at a rate of about $150 per person per decade.

Retirement is the third most important reason for FPE, and has ranged from $500 per capita to nearly $1000 per person over the period. This reason is also the most rapidly growing reason for the underutilization of human capital among working age males. Per capita FPE due to retirement has grown about $190 per decade, or nearly $350 over the 1975–1992 period.

People reporting being **"discouraged"** from seeking work due to poor job prospects is a small, but rapidly growing, proportion of FPE; it ranged from 2 percent to 6 percent of FPE over the

period. Per capita FPE due to this discouraged worker effect showed an upward trend over the period of about $140 per decade.

The reasons for FPE were aggregated into **voluntary** (retirement, voluntary part-time work, housework) and **involuntary** reasons (unemployment, discouraged from obtaining work, illness/disability). An upward trend for voluntary reasons is observed; the trend for involuntary reasons is negative. At the beginning of the period, the ratio of voluntary to involuntary FPE was about 25 percent; by the end of the period, the ratio had risen to about 37 percent. Over the 1975–1992 period, per capita FPE attributed to voluntary reasons **increased** by about $240 per decade, while per capita FPE due to involuntary reasons fell by about $130 per decade, despite the increase in the discouraged worker component.

Race, Age and Education Patterns of Human Capital Underutilization

Patterns of human capital underutilization were explored for four age groups (18–24, 25–39, 40–54, 55–64), four education groups (<12 years, 12 years, 13–15 years, 16+ years) and two race groups (white and non-white).

About 35 percent of white males of working age have FPE (i.e., did not fully utilize their human capital) in 1992, while the corresponding figure for non-whites is 50 percent. This gap narrowed slightly from 1975 to 1992. Among those with FPE, the racial gap in FPE decreased from $1170 to $930—or by one-fifth of the initial level. However, the proportion of FPE explained by the discouraged worker reason was three times larger for non-whites than whites at the beginning of this period, and increased at twice the amount for non-whites relative to whites over the period.

Across age groups, young males (18–24 year olds) have the highest prevalence of FPE, with disturbingly high rates of 59 percent for whites and 66 percent for non-whites. The oldest age group also has a high proportion of workers that work less than the full time-full year norm, 50 percent for whites and 62 percent for non-whites. Furthermore, the older males had the largest decrease in their

utilization of human capital among age groups: their average capacity utilization rate (CUR) decreased from 73 percent to 65 percent from 1975 to 1992. CUR fell more for whites than non-whites in this older group, suggesting an increased propensity for whites to retire (or at least reduce their working hours) prior to age 65, relative to non-whites.

Across education groups, college graduates and high school dropouts had the largest increases in the prevalence of FPE. The growth of FPE-prevalence among older workers with low education levels exceeded that for youths with low education, suggesting that the deterioration of the low-skill labor market was not targeted on youths, as is generally perceived.

Patterns of Human Capital Underutilization among Vulnerable Groups

For **low education non-white youths** (those who dropped out of high school and those with a terminal high school degree), potential earnings fell precipitously over the 1975–1992 period. The decrease was 16 percent per decade, as compared to a 5 percent per decade drop for all males; moreover, these decreases came on very low potential earnings of about $15,000 in 1975. Although the level of per capita FPE **decreased** for both groups of minority youths, the ratio of per capita earnings to total potential earnings—the CUR—fell substantially over the period for both groups. By 1992, the CUR of non-white dropouts was only about 53 percent; that for minority youths with only a high school degree was about 65 percent. Discouragement over finding work and illness accounted for a much larger share of FPE for the minority youths than for all youths. Moreover, the fall in the voluntary CUR—the indicator of labor utilization attributable to reasons classified as "voluntary"—was very large for minority youth dropouts, registering a decrease of nearly 4.5 percentage points over the 1975–1992 period, resulting in a voluntary CUR of less than 80 percent by 1992.

For **low education minority older workers**, potential earnings also decreased substantially over the period—by 9 percent per decade for dropouts and 6 percent for high school graduates; the

decrease was 3 percent for all older workers, and 5 percent for all males of working age. The indicator of human capital underutilization—FPE—is very high for low education minority, older males, relative to their earnings potential. As a result, the CUR for these groups was only about 60–65 percent in 1975, as compared to 73 percent for all older workers and 85 percent all males. However, in contrast to the pattern for low-education minority youths, FPE for the older, low-education minority workers rose substantially over the 1975–1992 period. As a result, the CUR for older minority dropouts fell by nearly 10 percentage points (to about 50 percent), while the CUR for terminal high school graduates decreased by 15 percentage points (to about 53 percent). For all older workers, the CUR decreased by about 9 percentage points (to 78 percent); it fell by only 1.6 percentage points for all males (to about 83 percent). For both older minority dropouts and those with a terminal high school degree, illness is the single largest reason for FPE; in 1975, it accounted for nearly two-thirds of FPE for the dropout group, and 40 percent of FPE for the older workers with a terminal high school degree. However, largely because of the increase in retirement, voluntary FPE grew for all of the older groups. This growth, in combination with the decrease in potential earnings, caused the voluntary CUR for low-education minority older males to fall over the period—by 14–16 percentage points for the two low schooling groups, as compared to decreases of 9 percentage points for all older males and 1.6 percentage points for all males. By 1992, then, the voluntary CUR for the two minority groups had fallen to about 70 percent from its start-of-the-period level of over 85 percent.

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TABLE 1

Percentage of 18–64-Year-Old males in Annual Hours Categories

	Annual Hours			
Year	0	1-2079	2080	>2080
1975	7.7	31.1	34.6	26.6
1991	9.7	29.2	32.8	28.3
1991–1975	2.0	-1.9	-1.8	1.7
1979	7.4	29.7	34.2	28.7
1989	8.8	26.1	34.7	30.4
1989–1979	1.4	-3.6	0.5	1.7

Source: Own calculations, 1976, 1980, 1990, 1992 CPS.

TABLE 2

Per Capita Earnings Measures, Males, 18–64 Years Old

Year	Earnings	Potential Earnings	Foregone Potential Earnings	Capacity Utilization Rate
1975	$24,004	$28,206	$4,201	85.1
1976	24,630	28,780	4,150	85.6
1977	24,367	28,261	3,893	86.2
1978	24,966	28,801	3,836	86.7
1979	24,849	28,634	3,785	86.8
1980	24,039	28,725	4,236	85.0
1981	22,996	27,335	4,339	84.1
1982	22,380	27,424	5,045	81.6
1983	22,303	27,295	4,992	81.7
1984	22,919	27,448	4,529	83.5
1985	23,011	27,310	4,299	84.3
1986	23,892	28,329	4,437	84.3
1987	23,793	28,101	4,308	84.7
1988	23,373	27,317	3,944	85.6
1989	23,333	27,153	3,820	85.9
1990	22,285	26,176	3,891	85.1
1991	21,450	25,613	4,163	83.8
1992	21,181	25,494	4,313	83.1
Percentage Change: 1975–1992	-11.8	-9.6	+2.7	-2.4

TABLE 3

Foregone Potential Earnings and its Components, Males, 18–64 Years Old by Race

	Non-Whites		Whites	
	1975 Level	Per Decade Change	1975 Level	Per Decade Change
Potential Earnings	$21,663	-$1,188	$29,400	-$1,104
Total FPE	$5,189	-$129	$4,020	$3
Unemployment	2,163	-264	1,569	-118
Discouraged	174	24	59	10
Illness	1,838	-20	1,168	-16
Housework	74	5	55	3
Retirement	230	13	551	23
Voluntary PT	119	1	138	2
Other	592	-10	481	-10
Voluntary FPE	$424	$19	$744	$28
CUR	76.0	-.6	86.3	-.5
Voluntary CUR	94.2	-.9	95.4	-.9

TABLE 4

Foregone Potential Earnings and its Components, by Age
(Only the youngest and oldest age groups are shown)

	Age 18–24		Age 55–64	
	1975 Level	Per Decade Change	1975 Level	Per Decade Change
Potential Earnings	$17,645	-$2,700	$27,720	-$960
Total FPE	$4,207	-$379	$7,369	$1,130
Unemployment	2,592	-503	1,133	-29
Discouraged	218	193	62	12
Illness	283	7	2,985	-600
Housework	27	4	71	11
Retirement	1	7	2434	1,562
Voluntary PT	357	19	235	129
Other	729	-14	448	-7
Voluntary FPE	$385	$66	$2,740	$1,702
CUR	76.2	-1.5	73.4	-5.1
Voluntary CUR	92.3	-1.0	86.5	-7.1

TABLE 5

Foregone Potential Earnings and its Components, by Education (only those with no college are shown)

	High School Dropouts		High School Graduates	
	1975 Level	Per Decade Change	1975 Level	Per Decade Change
Potential Earnings	$22,280	-$4,265	$27,491	-$3,571
TOTAL FPE	$5,901	-80.1	$3,865	201
Unemployment	2,023	-137	1,787	-132
Discouraged	103	264	84	154
Illness	2,548	-302	904	85
Housework	73	40	46	37
Retirement	550	138	480	147
Voluntary PT	104	7.4	109	5
Other	500	-91	452	-94
Voluntary FPE	$727	$185	$636	$189
CUR	73.5	-6.4	85.9	-3.2
Voluntary CUR	93.0	-3.6	95.6	-1.4

TABLE 6

Foregone Potential Earnings and its Components, Males, 18–64 Years Old: Low Education Minority Youths, All Youths, and All Males

	Non-White Dropouts, Ages 18–24		Non-White High School Degree, Ages 18–24		All Ages 18–24		All Working Age Males	
	1975 Level	Per Decade Change	1975 Level	Per Decade Change	1975 Level	Per Decade Change	1975 Level	Per Decade Change
Potential Earnings	$14,210	-$2,221	$16,475	-$2,610	$17,645	-$2,700	$28,206	-$1,518
Total FPE	$6,134	-$720	$4,845	-$455	$4,206	-$379	$4,201	$17
Unemployment	3,085	-877	3,090	-717	2,592	-503	1,661	-122
Discouraged	719	324	323	332	218	193	76	140
Illness	793	-91	365	52	283	7	1,271	-150
Housework	90	77	63	38	27	39	58	32
Retirement	0	15	0	1	1	7	502	189
Voluntary PT	212	10	316	1	357	66	135	19
Other	1,236	-179	688	-162	729	-142	499	-90
Voluntary FPE	$302	$102	$379	$40	$385	$66	$695	$240
CUR	56.8	-1.8	70.6	-2.3	76.2	-1.5	85.1	-.9
Voluntary CUR	84.0	-2.4	86.9	-1.1	92.3	-1.0	95.3	-.9

TABLE 7

Foregone Potential Earnings and its Components, Males, 18–64 Years Old: Low Education Minority Older Males, All Older Males, and All Males

	Non-White Dropouts, Ages 55–64		Non-White High School Degree, Ages 55–64		All Ages 55–64		All Working Age Males	
	1975 Level	Per Decade Change	1975 Level	Per Decade Change	1975 Level	Per Decade Change	1975 Level	Per Decade Change
Potential Earnings	$17,607	-$1,610	$24,977	-$1,626	$27,725	-$960	$28,206	-$1,518
Total FPE	$7,201	$134	$8,019	$1,438	$7,369	$1,130	$4,201	$17
Unemployment	1,261	-131	1,673	-143	1,133	-2	1,661	-122
Discouraged	30	228	0	248	62	126	76	140
Illness	4,616	-598	3,158	96	2,985	-602	1,271	-150
Housework	111	-4	110	43	71	11	58	32
Retirement	770	686	2,111	1,387	2,434	1,562	502	189
Voluntary PT	161	27	255	121	235	129	135	19
Other	252	-74	712	-314	448	-66	499	-90
Voluntary FPE	$1,042	$709	$2,476	$1,551	$2,740	$1,701	$695	$240
CUR	59.1	-5.4	67.9	-8.3	73.4	-5.1	85.1	-.9
Voluntary CUR	88.9	-7.8	84.2	-8.6	86.5	-7.1	95.3	-.9

TABLE 8

Decadal Changes in Labor Market Opportunities, Civilian Non-Student Male Working-Age Population, and Various Subgroups

	Potential Earnings 1975 (Rank)	Percent Decadal Change in Potential Earnings	Involuntary FPE 1975	Percent Decadal Change in Involuntary FPE	Rate of Available Potential Earnings 1975	Percent Decadal Change in Rate of Available Potential Earnings
All	$28,205	-5.4	$3,008	-4.4	89.3	-0.1
All Non-Whites	21,663 (10)	-5.5	4,174	-5.2	80.7	0.2
All Whites	29,400 (4)	-3.8	2,795	-6.4	90.5	0.3
Ages 18–24	17,645 (11)	-15.3	3,093	-9.8	82.5	-1.0
Ages 25–39	28,484 (5)	-9.7	2,318	3.1	91.9	-1.2
Ages 40–54	32,952 (2)	-2.7	3,126	-0.8	90.5	-0.2
Ages 55–64	27,725 (6)	-3.5	4,181	-12.1	84.9	1.6
High School Dropouts	22,280 (9)	-19.1	4,674	-3.7	79.0	-5.2
High School Graduates	27,941 (7)	-13.0	2,777	3.9	89.9	-2.3
Some College	30,670 (3)	-6.8	2,286	3.7	92.5	-0.9
College Graduates	37,541 (1)	0.8	1,321	13.1	96.5	-0.5
Non-White Dropouts, Ages 18–24	14,210 (14)	-15.6	4,597	-14.0	67.7	-0.2
Non-White High School Graduates, Ages 18–24	16,475 (13)	-15.8	3,778	-8.8	77.1	-2.2
Non-White Dropouts, Ages 55–65	17,607 (12)	-9.1	5,906	-8.5	66.5	-0.2
Non-White High School Graduates, Ages 55–64	24,977 (8)	-6.5	4,831	4.2	80.7	-2.4

Notes:

1) Potential earnings is in 1993 dollars.
2) Involuntary FPE is the sum of per capita earnings lost to unemployment, discouraged work and illness.
3) Rate of available potential earnings is {1 - [(per capita earnings lost to unemployment, discouraged work and illness)/(per capita potential earnings)]}*100.

TABLE 9

Decadal Changes in Labor Market Choices, Civilian Non-Student Male Working-Age Population, and Various Subgroups

	Potential Earnings 1975 (Rate)	Voluntary CUR 1975	Percent Decadal Change in Voluntary CUR	Voluntary FPE 1975	Percent Decadal Change in Voluntary FPE	Voluntary to Involuntary FPE Ratio 1975	Percent Decadal Change in Vol/Inv FPE Ratio
All	$28,205	95.3	-1.0	$695	34.5	.23	46.8
All Non-Whites	21,663 (10)	94.2	-1.0	424	44.8	.10	62.6
All Whites	29,400 (4)	95.4	-0.9	744	37.6	.27	54.6
Ages 18–24	17,645 (11)	92.3	-1.1	385	17.0	.12	35.7
Ages 25–39	28.484 (5)	97.6	-0.1	140	35.0	.06	31.9
Ages 40–54	32,952 (2)	97.4	-0.2	340	22.0	.11	25.0
Ages 55–64	27,725 (6)	86.5	-8.2	2,740	62.1	.66	95.3
High School Dropouts	22,280 (9)	93.0	-3.8	727	25.5	.16	34.1
High School Graduates	27,491 (7)	95.6	-1.5	636	29.6	.23	25.5
Some College	30,670 (3)	95.9	-0.7	678	30.7	.30	28.3
College Graduates	37,541 (1)	96.2	-1.1	778	55.6	.59	40.2
Non-White Dropouts, Ages 18–24	14,210 (14)	84.0	-2.9	302	33.7	.07	63.5
Non-White High School Graduates, Ages 18–24	16,475 (13)	91.6	-1.2	379	10.5	.10	21.8
Non-White Dropouts, Ages 55–65	17,607 (12)	88.9	-8.7	1,042	68.0	.18	98.7
Non-White High School Graduates, Ages 55–64	24,977 (8)	84.2	-10.2	2,476	62.6	.51	60.6

Notes:

1) Potential earnings is in 1993 dollars.

2) Voluntary CUR is {1 - (per capita earnings lost due to retirement, housework, voluntary part-time work and other)/(per capita potential earnings - (per capita earnings lost due to unemployment, discouraged from work and illness)}*100.

3) Voluntary FPE is the sum of per capita earnings lost to retirement, housework, and voluntary part-time work.

4) Voluntary to Involuntary FPE ratio is {(sum of per capita earnings lost to retirement, housework, and voluntary part-time work)/(sum of per capita earnings lost due to unemployment, discouraged from work and illness)}*100.

Figure 1
Mean Annual Hours
Males 18-24 Years Old, 1975-1992

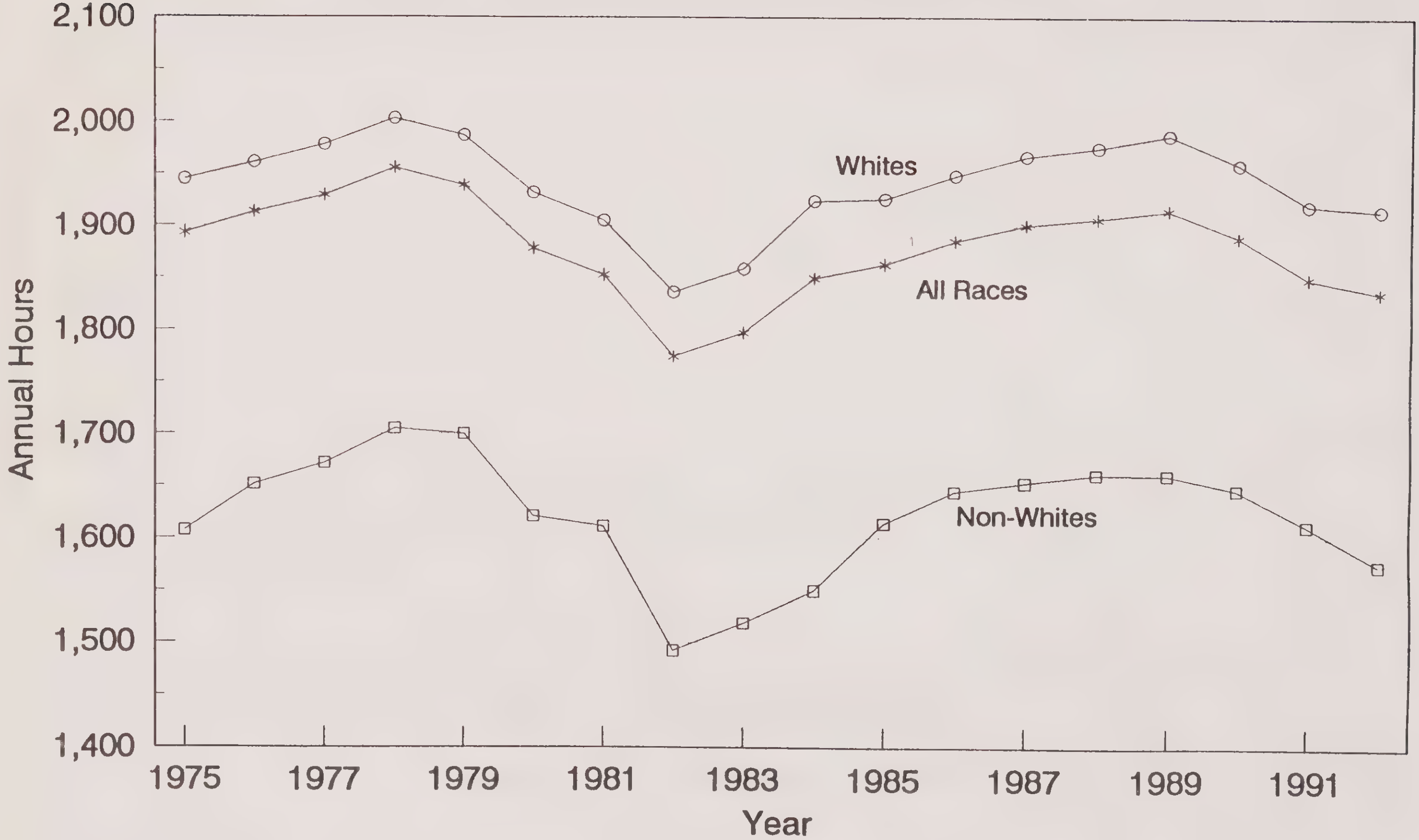


Figure 2
Capacity Utilization Rates
Males 18-64 Years Old

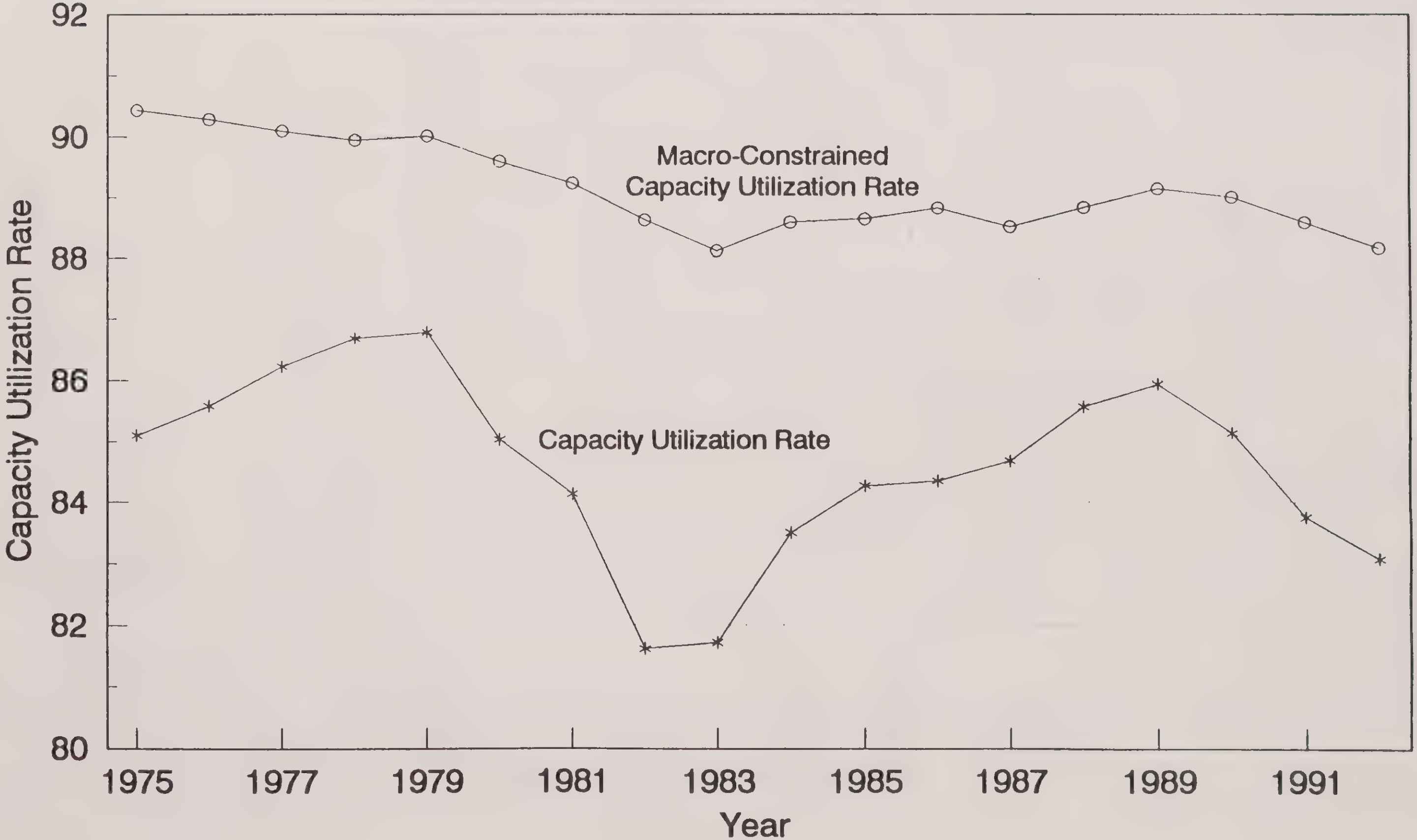
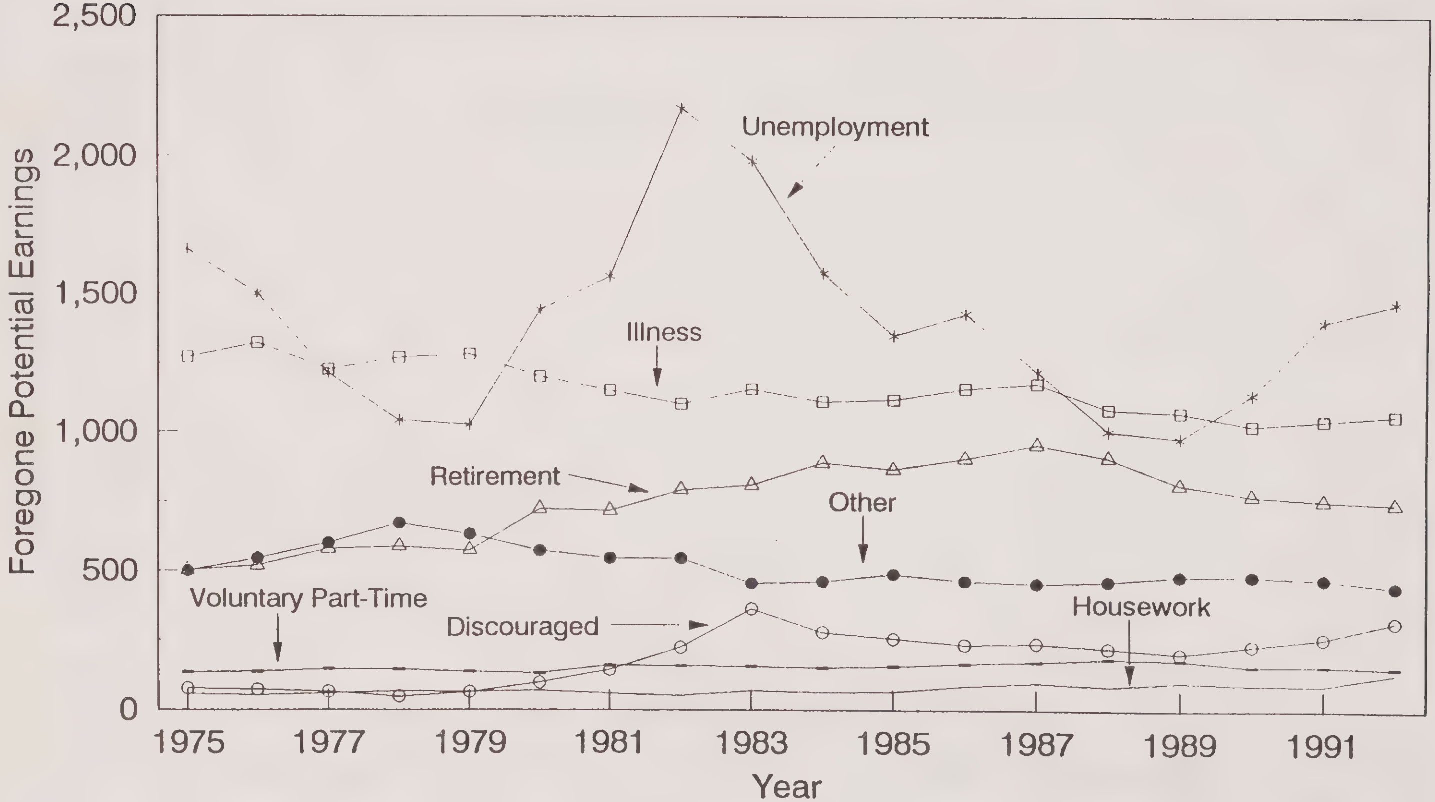


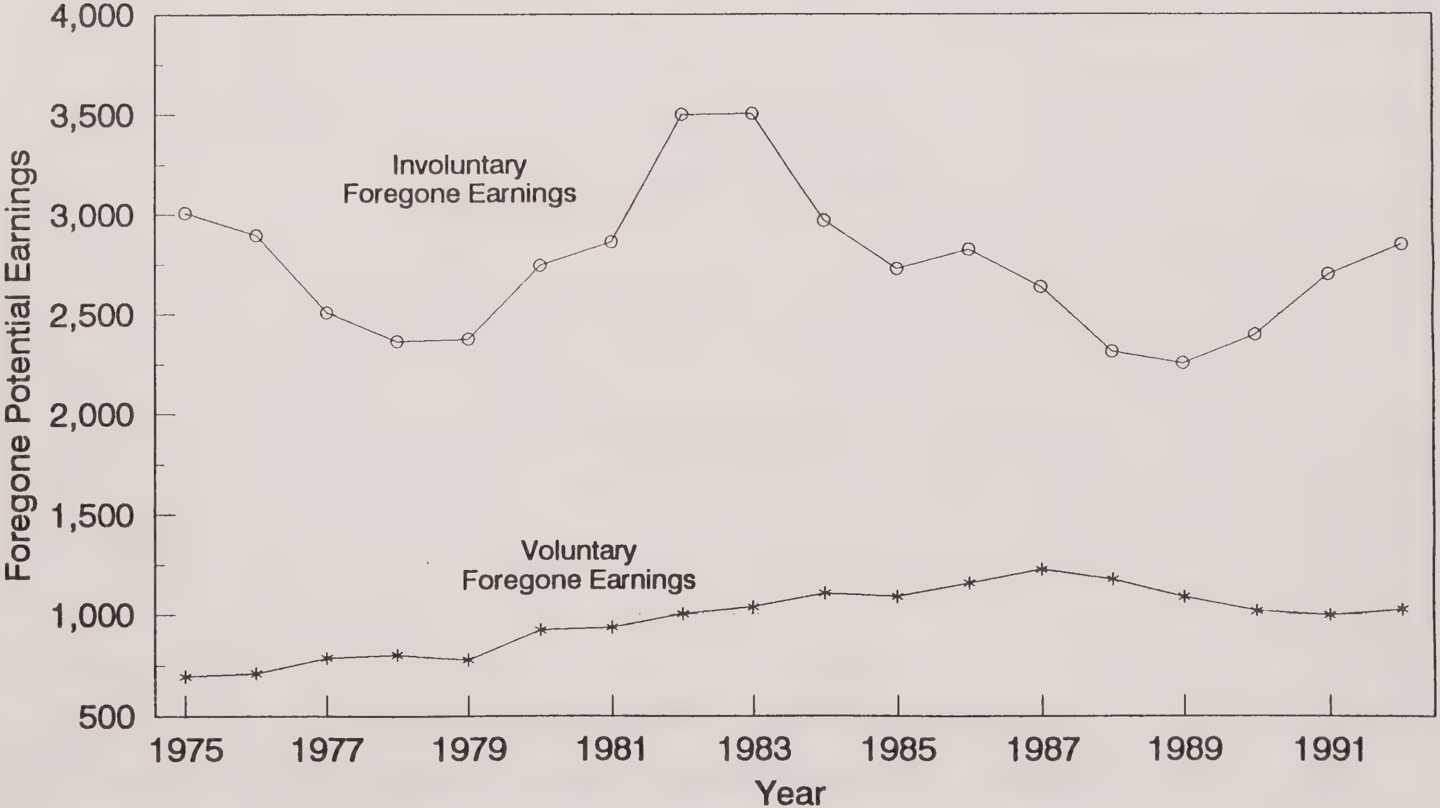
Figure 3
Per Capita Foregone Potential Earnings
Males 18-64 Years Old, by Reason



Earnings in 1993 dollars.

Figure 4

Voluntary and Involuntary Foregone Potential Earnings, Males 18-64 Years Old



Earnings in 1993 dollars.

Figure 5
Voluntary Capacity Utilization Rate
Males 18-64 Years Old

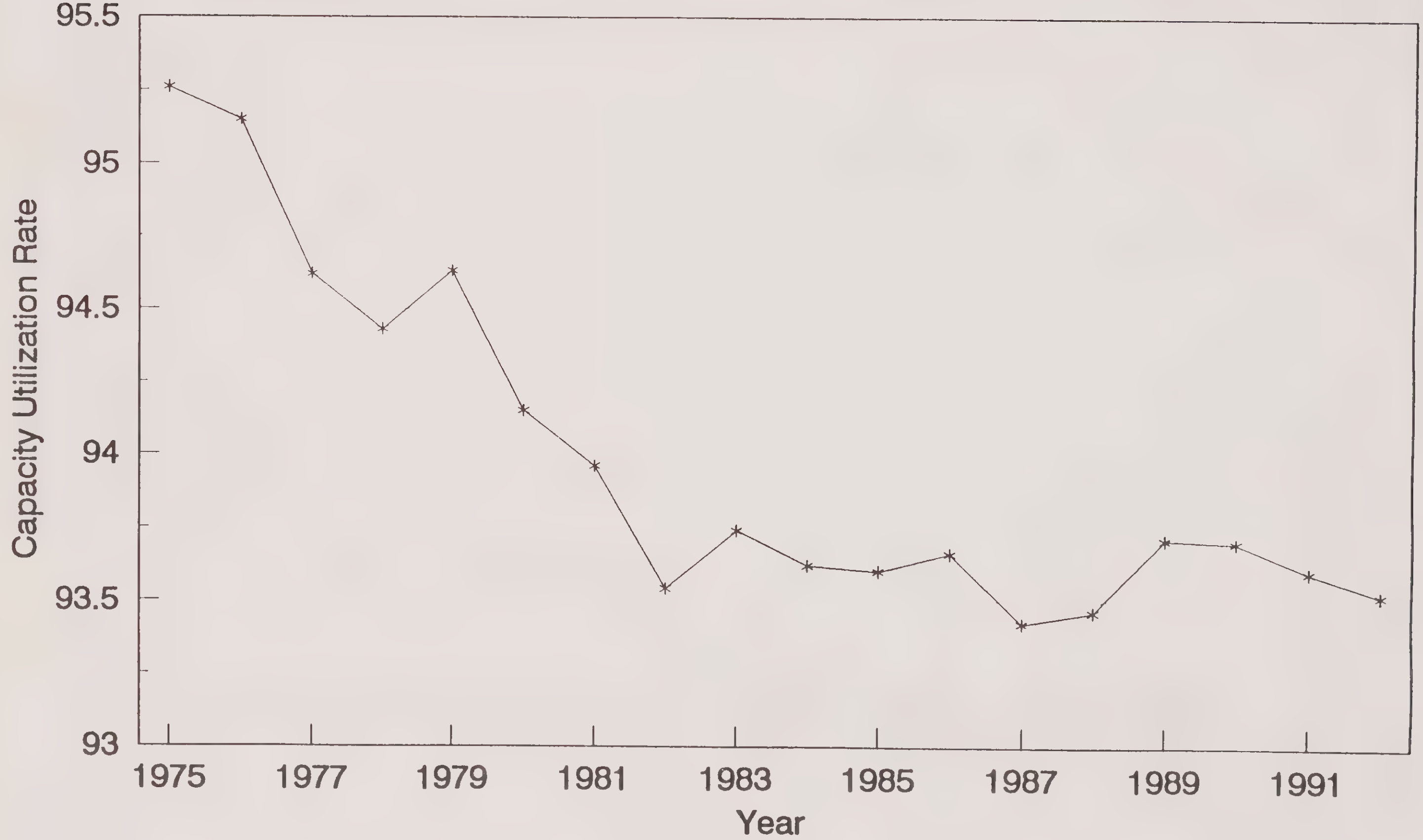
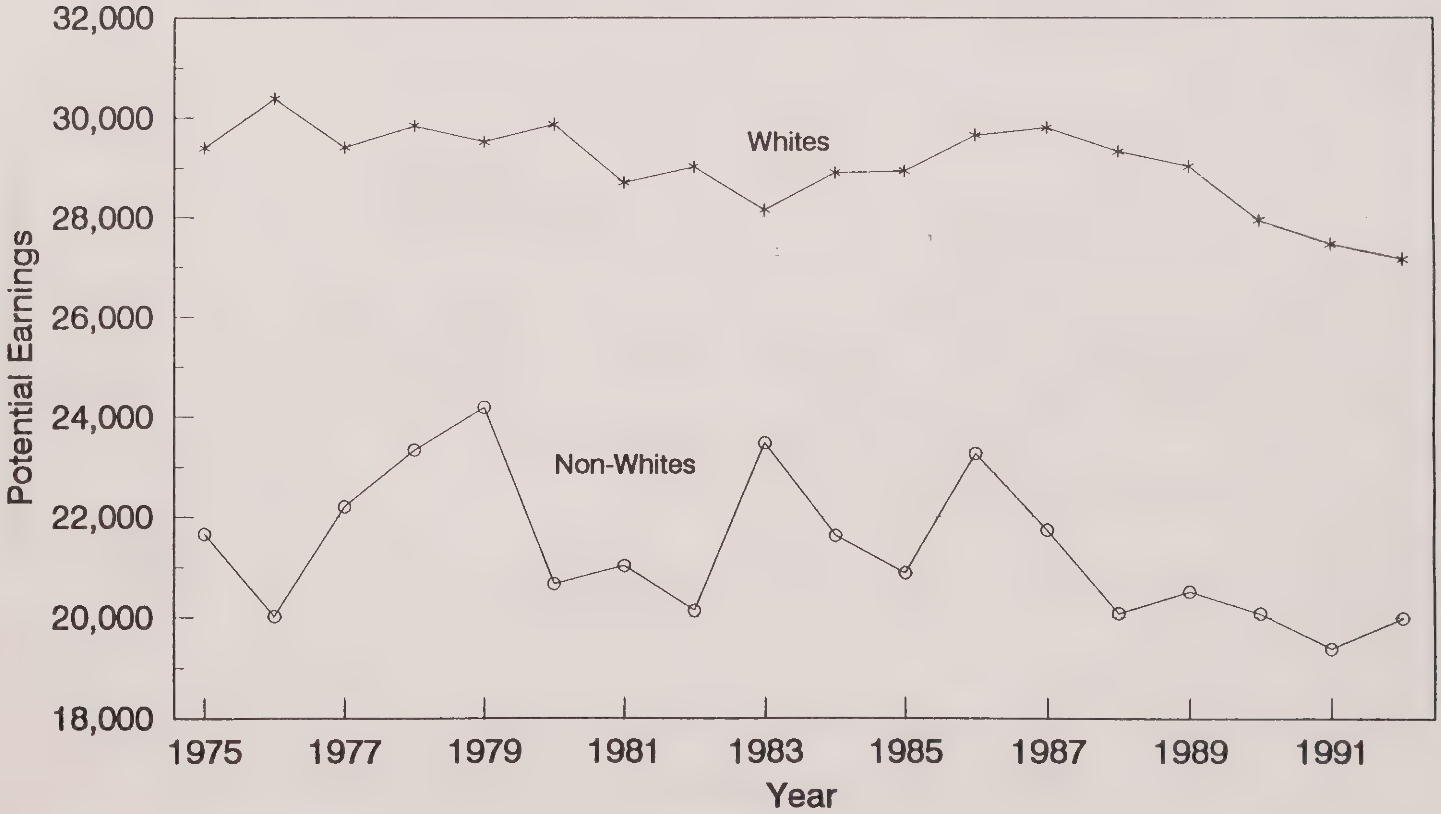


Figure 6

Per Capita Potential Earnings

Whites and Non-Whites, Males 18-64 Years Old

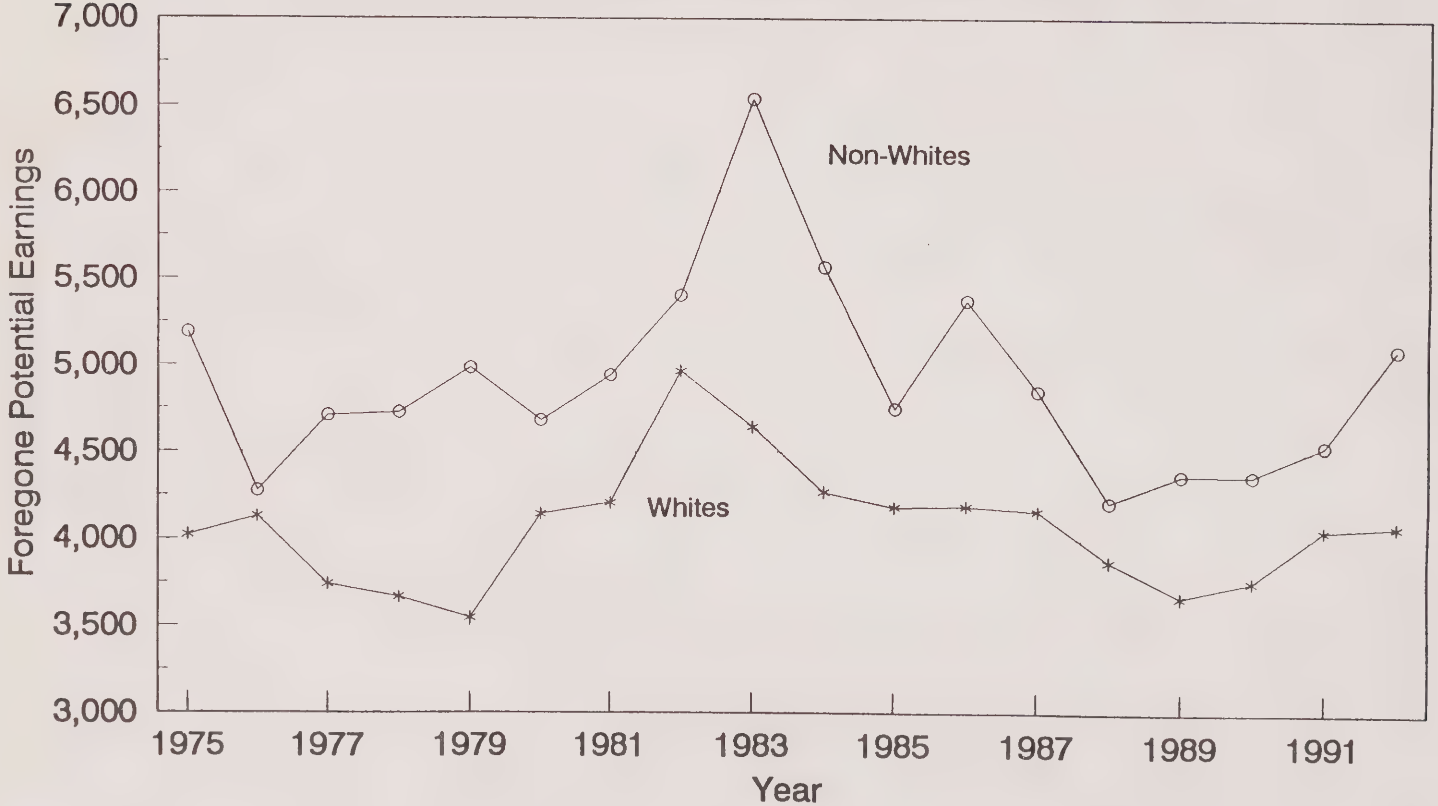


Earnings in 1993 dollars.

Figure 7

Per Capita Foregone Potential Earnings

Whites and Non-Whites, Males 18-64 Years Old



Earnings in 1993 dollars.

Figure 8
Capacity Utilization Rates
Whites and Non-Whites, Males 18-64 Years Old

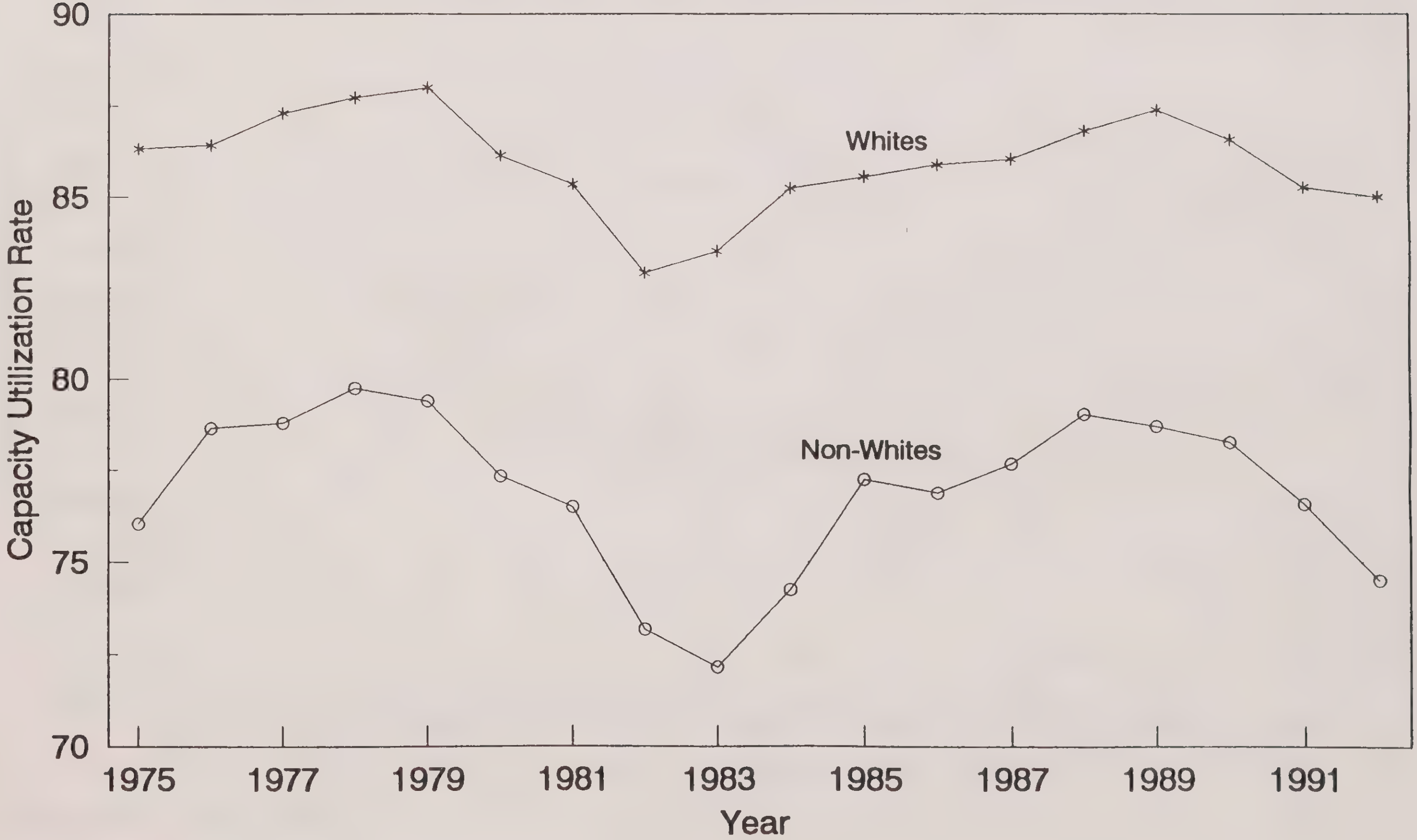
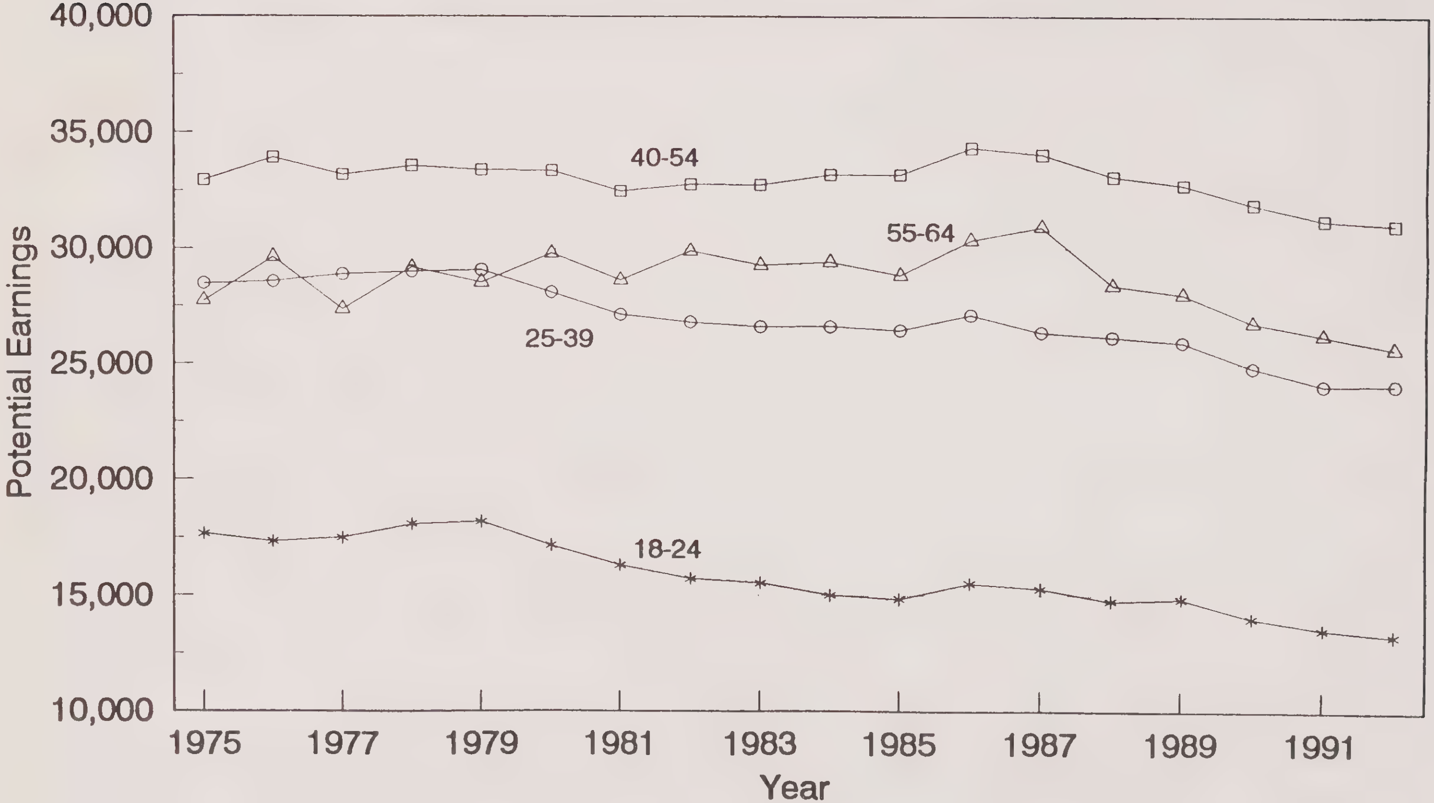


Figure 9
Per Capita Potential Earnings
Males 18-64 Years Old, by Age Group

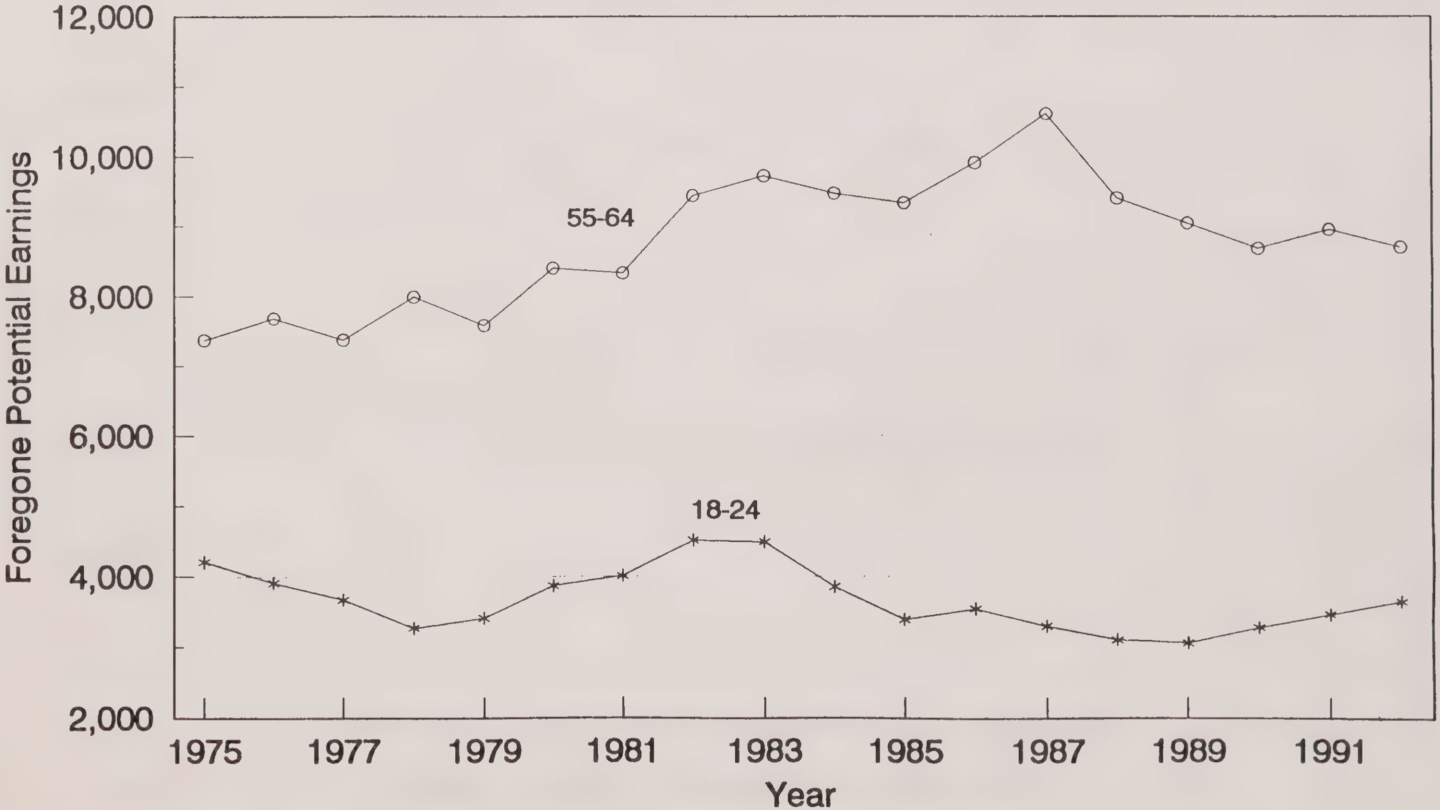


Earnings in 1993 dollars.

Figure 10

Per Capita Foregone Potential Earnings

Males 18-24 and 55-64 Years Old



Earnings in 1993 dollars.

Figure 11

Capacity Utilization Rates

Males 18-24 and 55-64 Years Old

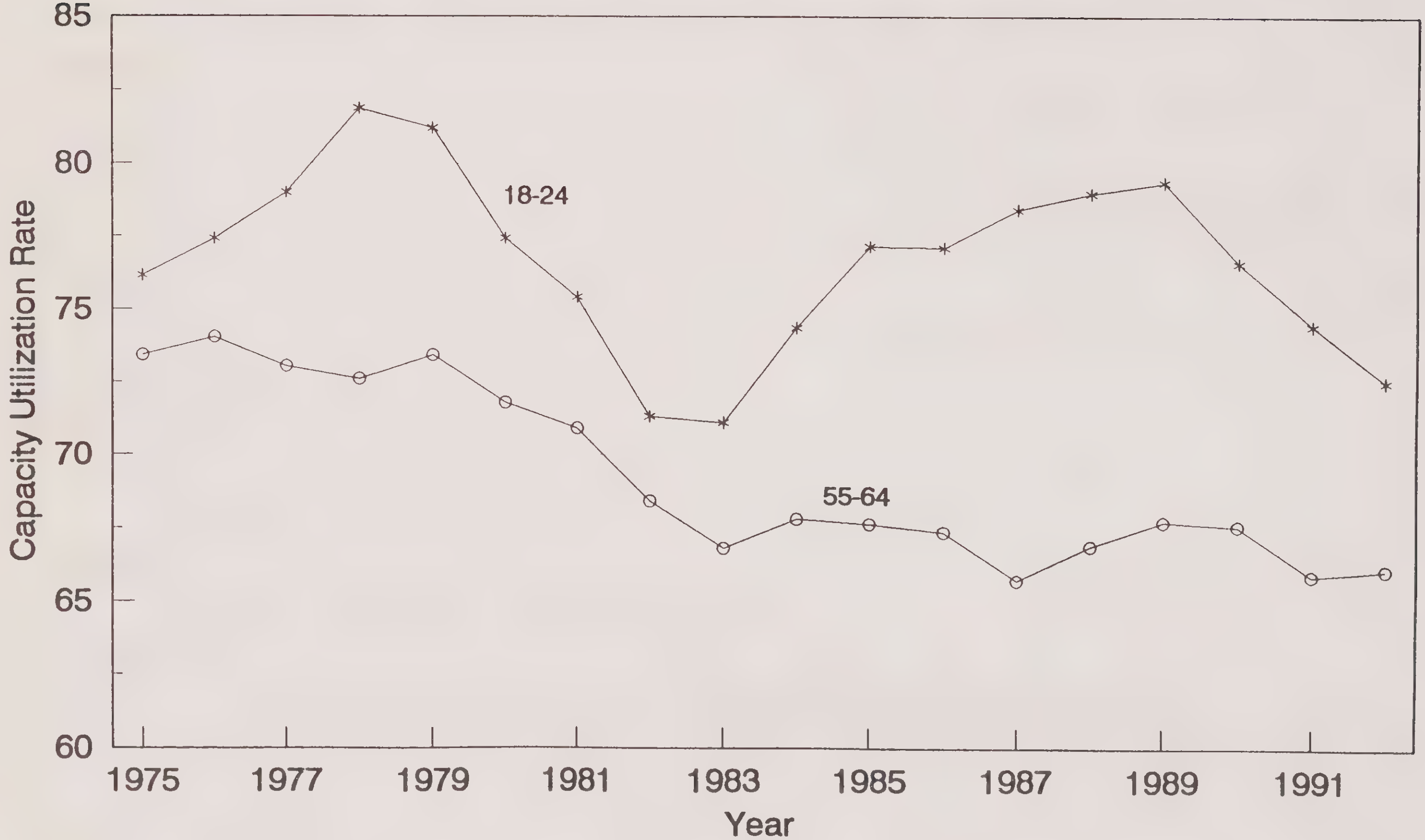
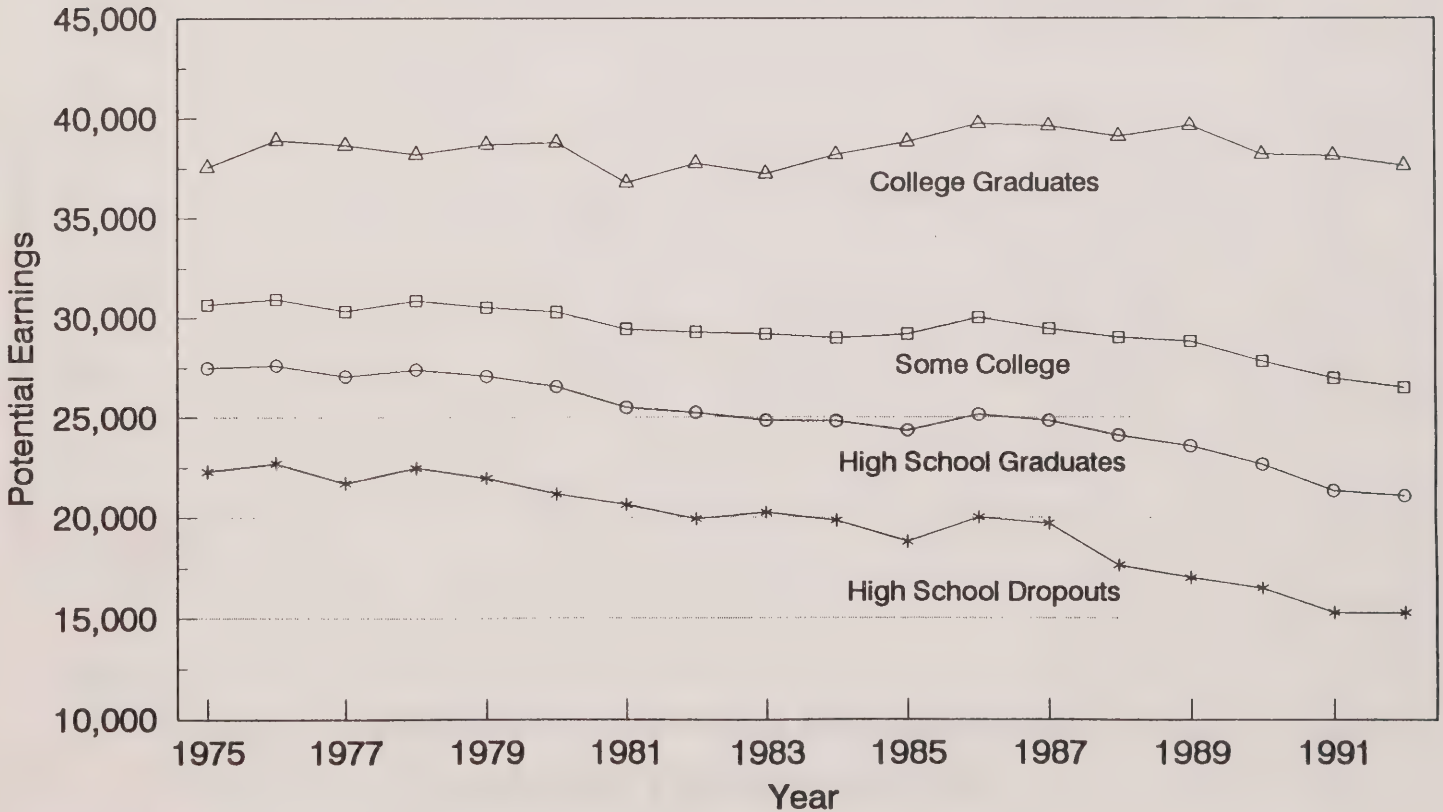


Figure 12

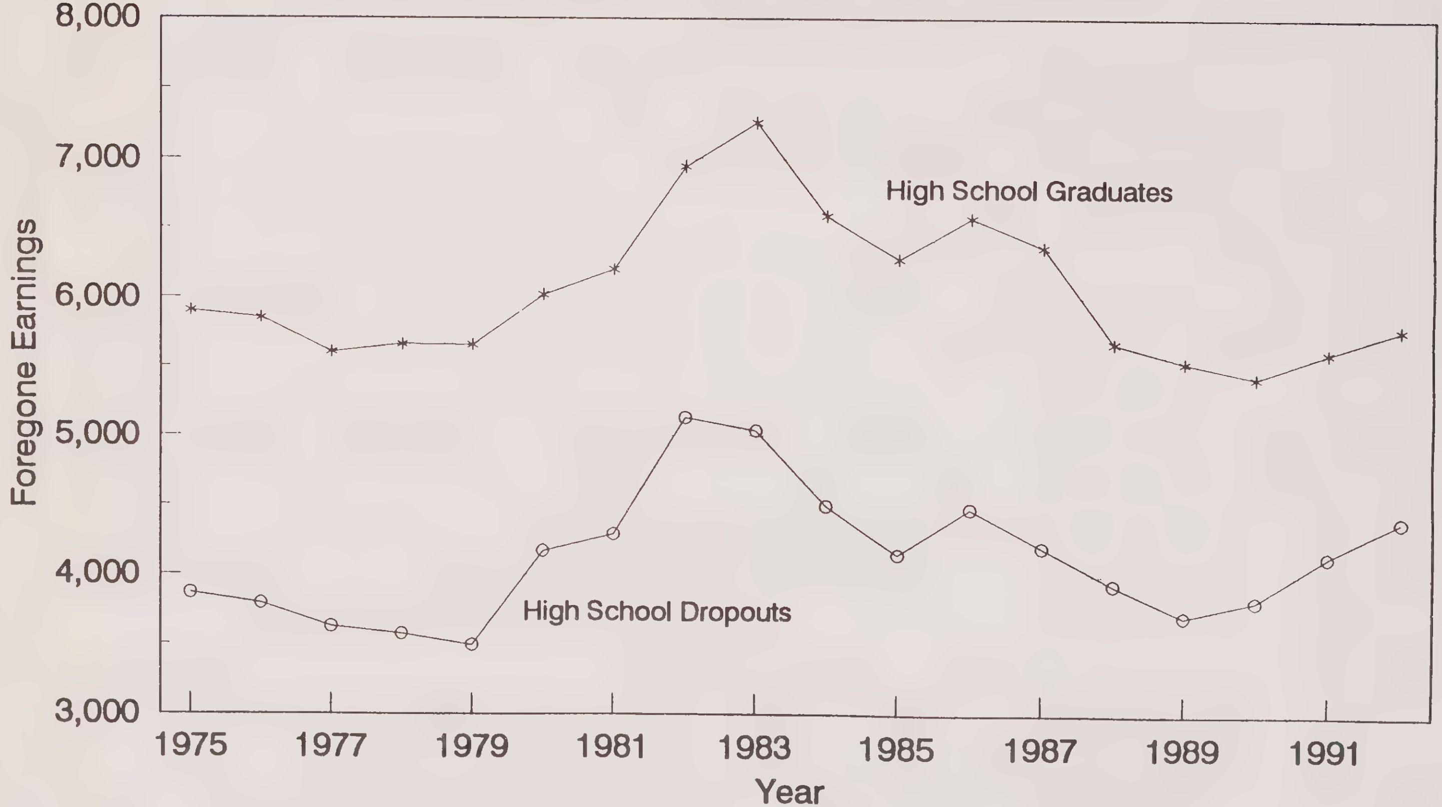
Per Capita Potential Earnings

Males 18-64 Years Old, by Education Group



Earnings in 1993 dollars.

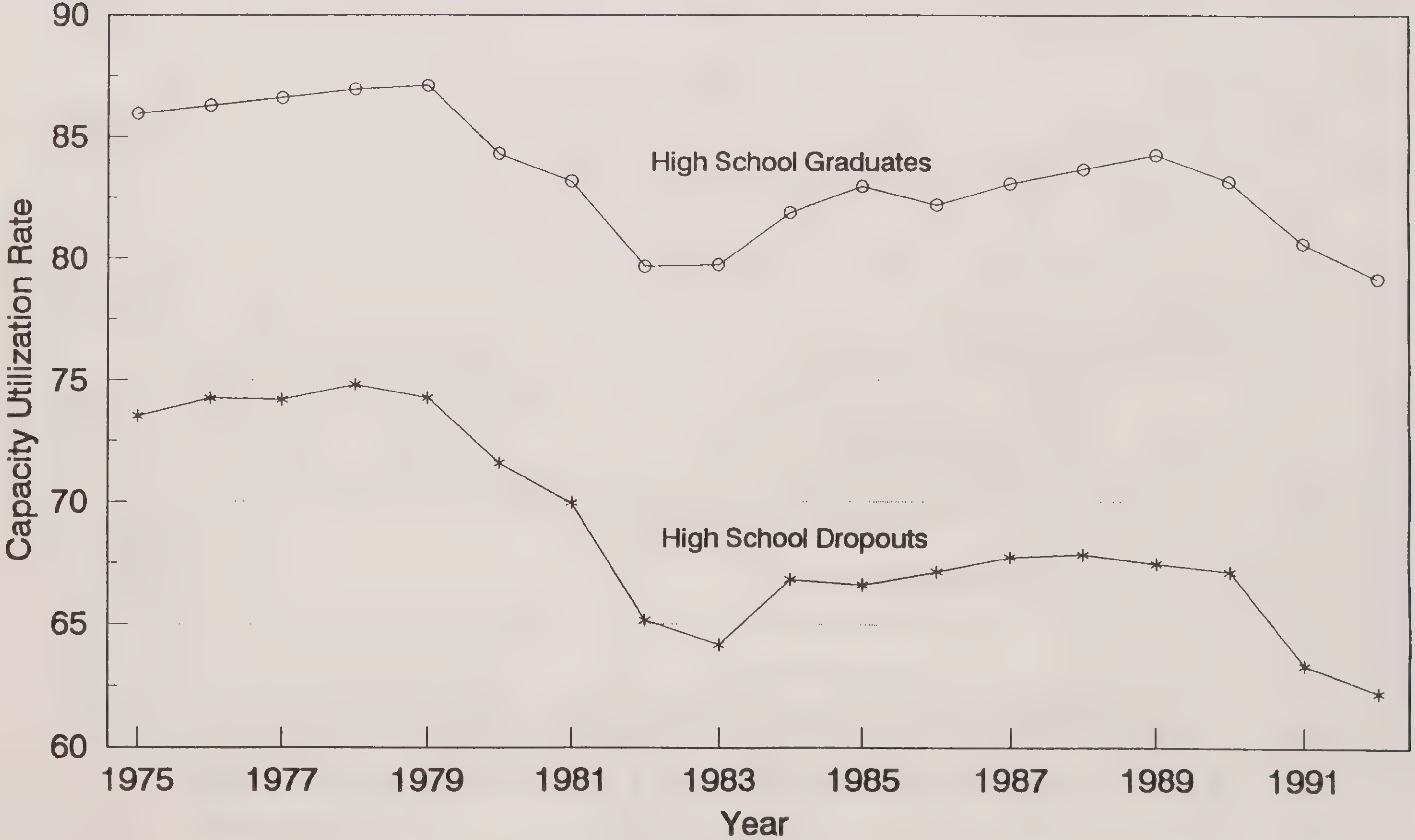
Figure 13
Per Capita Foregone Earnings, Males 18-64 Years Old, High School Dropouts and Graduates



Earnings in 1993 dollars.

Figure 14

Capacity Utilization Rates, Males 18-64 Years Old, High School Dropouts and Graduates



Changes in Working Time in Canada and the United States.
June 13-15, 1996
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Session 5 (ii)

Short-Time Work in the United States 1968-93 Implications for Evaluation of Short-Time Compensation Schemes

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Milken Institute for Job and Capital Formation

Conference presented by:
The Canadian Employment Research Forum (CERF)
in cooperation with:
Human Resources Development Canada,
Statistics Canada, and the
W.E. Upjohn Institute for Employment Research.

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PRELIMINARY: COMMENTS WELCOME

DO NOT CITE WITHOUT PERMISSION

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Abstract

Short-time compensation (STC) is widely used in many countries as a way to shift the burden of unemployment from layoffs to reduced hours, financed by partial unemployment insurance (UI) benefits. A key factor in analyzing the potential impact of STC is the propensity to use short-time work (STW). STW is reduced hours employment that is not subsidized by UI benefits. Surprisingly, the role of STW has received scant attention in the analysis of STC. This paper corrects that deficit, showing that STW is widespread in the U.S. despite only limited usage of existing STC programs. One conclusion is that analyses that ignore the role of STW undoubtedly overstate the potential for layoff reductions under STC and understate the degree of subsidy provided by STC programs to firms that already make ample use of STW.

JEL Classification:

from the Canadian Employment Research Forum is graciously acknowledged. All errors are my own.

1. Introduction

Abraham and Houseman's (1993; 1994) recent calls for a systematic reorganization of United States job security policies have again raised the specter of reduced-hours employment — financed through short-time compensation (STC) — as an alternative to layoffs. Under STC[1] workers receive partial unemployment insurance (UI) benefits as compensation for reduced working hours. While STC programs are widely used in countries such as Belgium, Canada, France, and Germany, in the U.S. they are currently available in only eighteen states and the usage rates are extremely low (Vroman, 1990).[2]

The literature typically assumes that workers put on STC are not drawn from the pool of those who would have had their hours reduced anyway, even without an STC program. Such a state of reduced-hours employment is called short-time work (STW). There has been virtually no discussion of the role of STW in evaluating STC programs in the existing literature. This paper's main focus is a critique of the (almost universal) implicit assumption that STW workers are not the primary candidates for STC payments. The paper's first contribution is methodological, reintroducing the concept of STW to the

[1]STC is frequently called "shared work" or "worksharing" by both researchers (Benarzik, 1980; Meltz and Reid, 1983; Vasche, 1982) and state UI agencies in the United States (NFUCWC, 1996, p. 58). However, shared work is more commonly used to refer to permanent reductions in average hours per worker (Calmfors, 1985; Fitzroy, 1981; Calmfors and Hoel, 1989; Hart, 1984; Riechel, 1986), which is distinct from temporary reductions that are funded by partial UI benefits. The STC name is used exclusively in this paper because it has no alternative interpretations.

[2]Illinois discontinued its program in 1988 (Vroman, 1990).

debate over STC.

The paper's second contribution is empirical, providing evidence that STW is already widely used in the United States, both in states with very low usage of STC and in states with no STC program at all. On a per-worker basis, STW is used almost as much as layoffs. Thus, it is argued, widespread expansion of STC programs is most likely to benefit workers already on or subject to STW, not necessarily workers on or subject to layoffs. There is not necessarily anything wrong with this conclusion. Just as the UI system was set up to provide consumption insurance to workers subject to employment shocks, STC programs could be expanded to insure STW workers against partial employment shocks. However, this aspect of STC has not been a focus of previous authors, who instead have concentrated on the spillover effects of STC on layoffs.

In an era of tight budgets and reduced social welfare spending, this is a significant omission. In particular, the degree of imperfect experience rating of STC benefits is comparable to that for UI benefits. The extensive literature on excessive use of UI due to this subsidy suggests that widespread introduction and expansion of STC programs will lead to similar overuse of STC. Whether imperfect experience rating of both UI and STC benefits leads to a relatively greater overuse of layoffs, STW, or both is an empirical question. However, the overall net public subsidy to these two channels — layoffs and STW — would ensure an excessive impact of demand shocks on the existing pool of workers.

The paper is organized as follows. The next section discusses the existing literature on

STC and related evidence on employment adjustment using layoffs versus hours. Section three presents the empirical evidence that STW is already widely used in the U.S. Particular attention is paid to the prevalence of STW in STC and non-STC states. Section four concludes the paper.

2. Relation to existing literature

2.1. Short-time compensation and short-time work

Unemployment insurance was conceived as a program to insure workers' consumption against unexpected employment shocks. It was *presumed* that the beneficiaries would be people who would suffer an unemployment spell *regardless* of whether a UI payment system were in place. However, an extensive literature has highlighted an unintended side-effect of the UI system in the absence of perfect experience rating: workers get laid off who would otherwise have remained employed because UI payments offer an implicit subsidy to layoffs (Hamermesh, 1993, pp. 307-315). Many papers have attempted to measure the number of "excess" layoffs created by imperfect experience rating. Approximately 20-40 percent of temporary layoffs fall in this category (Topel, 1983; Card and Levine, 1994; Anderson and Meyer, 1994). This figure is substantial and has direct implications for potential overuse of STC, as discussed below. However, the pertinent observation for this section is that a majority of UI claimants would have been laid off even in the absence of a UI program. This suggests that the primary beneficiaries of STC programs are likely to be people who would be put on STW even in the absence of an STC program.

There are three pools of workers from which STC-compensated employees can be drawn, with each group denoted by the state they would have been in in the absence of an STC program: workers who are laid off in response to a demand shock, workers whose hours are not adjusted at all, and workers whose hours are cut back. The prevalent view in the literature is that only the first and second groups of workers are tapped for inclusion in STC programs:

> [S]hort time compensation (STC) represents an alternative to layoffs as a way for firms to reduce labor inputs in periods of slack demand. Currently the standard procedure for reducing work hours is to lay off the least senior employees. This action concentrates the reduction in hours narrowly among a small number while leaving other workers unaffected. An alternative procedure for reducing labor input is to retain all employees by reducing weekly hours for a much larger fraction of the firm's work force. (Vroman, 1990, p. 71)

Little mention is made of the existence of STW in the absence of STC, particularly by those advocating STC programs. One notable exception is Hamermesh (1978), who noted that

> While the subsidy [STC] will to some extent encourage the expansion of the activity that is subsidized [STW], it will also reward those economic agents — in this case firms and workers — that would engage in the subsidized activity even in the absence of the subsidy ... Because of this windfall much

of the payment for short-time work under any STC scheme cannot result in increased employment, but is instead a transfer from those whose taxes exceed their receipts from STC to those for whom the opposite is true. (pp. 249-250)

The vast majority of authors since Hamermesh have simply ignored this issue. One of the lone exceptions is Best (1981) who dismisses Hamermesh's critique, stating that

> [T]he incidence of such workweek reduction [STW] appears to be low in the United States and commonly smaller than the 10 percent threshold reduction of worktime required before employees are eligible to receive benefits. (p. 96)

In support of this conclusion, Best cites only one source, Henle (1978), who stated that "the evidence seems to indicate that the prevalence of such work sharing arrangements is quite limited" (p. 267). This conclusion was based on union contract data showing that (a) about twenty percent of contracts provided for hours reductions in the face of slack work, and (b) such provisions were generally not utilized. However, this was the full extent of statistics provided to support these conclusions.[3] Moreover, because unionized workers account for only a minority of the work force, Best's dismissal of the importance of STW is clearly premature without additional evidence for non-unionized workers.

The only other study to look at the incidence of STW is Bednarzik's (1980), who tracked the aggregate STW rate for 1956-79. However, the only comparison made with other aspects of the labor market was the aggregate unemployment rate. This created

[3] In particular, no indication was given that the contracts were drawn from a representative sample.

the misleading impression that STW is relatively underutilized because the unemployment rate is many times larger than the STW rate. The proper comparison for an STC evaluation is STW versus layoffs, because both represent employer-initiated changes in hours in response to demand shocks. Moreover, as can be seen in Table 1, layoffs typically account for only about fifteen percent of unemployment in any given year. As shown below, the incidence of STW in fact is comparable to the incidence of layoffs.

2.2. Employment versus hours adjustment

It has long been recognized that there are fixed costs to hiring and firing workers that inhibit a firm from using employment adjustment as the only way to adjust total labor input (Oi, 1962). Consequently, in the short run firms adjust hours per worker as a substitute for adjusting the number of workers (Rosen, 1968, Fair, 1969; see Caballero, *et al.*, 1995 for a recent example using data from individual manufacturing plants).

Previous research has directly compared employment and hours adjustment for the U.S. versus other countries that have much more liberal STC provisions (Abraham and Houseman, 1993, Van Audenrode, 1994). Both Abraham and Houseman and Van Audenrode find that the adjustment of total hours in the U.S. is done more through employment than through average hours per worker. Both studies conclude that the relative lack of a generous STC subsidy plays a role in this: U.S. firms use employment adjustment relatively more than hours adjustment presumably at least in part because the former are more heavily subsidized. However, Van Audenrode suggests that a reduced reliance on

layoffs would occur only if the proportionate subsidy to STC exceeded that for layoffs. Abraham and Houseman advocate an expansion of STC at the same time that experience rating for layoff UI benefits is tightened. Thus both studies do not presume that simple changes to STC alone would necessarily reduce firms' reliance on layoffs.

These authors' hesitance to advocate expansion of STC as the only way to shift labor adjustment away from layoffs is well-founded. In particular there are both institutional and mechanical differences between labor markets across different countries. Though STW may be used relatively more in countries with more liberal STC, such a correlation is not proof that *changes* in STC provisions would produce a similar reliance on STW in the U.S. In particular, tighter experience rating of UI alone might likely achieve the desired reduced reliance on layoffs *without* the need for a generous STC subsidy. This is precisely the point made by Burdett and Wright (1989), who show that an STC subsidy leads to an inefficient number of hours per worker.

The reliability of cross-country comparisons such as those above are also limited by the nature of shocks that hit particular industries. Only recently have we learned that aggregate net employment changes mask much larger offsetting flows through gross job creation and destruction. In particular, there are large differences in job reallocation rates between countries (Davis, *et al.*, 1996, p. 21). It is naive to presume that such cross-country differences can be fully explained by parameters of UI and STC alone. They undoubtedly arise due to differences in a host of factors such as country size, population and industrial concentration, internal migration patterns, barriers to entry for new

businesses, merger and takeover rules, union organizing laws, the demographic makeup of the labor force, societal differences in between-job mobility, welfare system influences on work behavior, overtime pay rules,[4] *etc.* Limiting the analysis to nominally comparable, narrowly defined industries (as Abraham and Houseman, 1993, do) does not negate the role of these other factors that affect the ability and preferences of individual firms to adjust labor input. Abraham and Houseman (1994) partially address this issue by analyzing the effect of weakening employment security laws in Germany, France and Belgium. They find that such changes — which presumably decreased the costs of layoffs — did not measurably increase reliance on employment (over hours) adjustment in those countries. While informative, such evidence again is not proof that expanding STC coverage in the U.S. would increase reliance on hours adjustment. If anything, their results suggest that such an expansion could easily have *no* measurable impact on the use of layoffs.

Thus there is a clear need to analyze the use of STW in the U.S. as a way of predicting the impact of STC programs. Such an analysis is better than cross-country comparisons of employment versus hours adjustment because a vast majority of between-country differences in other factors are held constant for a within-country analysis. Moreover, the data used here allow the identification of hours reductions below usual hours worked. They

[4] Differences in overtime pay rules and related societal conventions may be particularly important unexplained factors not accounted for by Abraham and Houseman and by Van Audenrode. Their analyses treat increases and decreases in labor usage symmetrically, with no metric for measuring the difference between usual hours and actual hours worked. Thus much of cross-country differences and similarities that they measure may be identified by deviations above, not below, usual hours worked.

also allow the identification of employment adjustment through layoffs. Both of these are more accurate measures of the relevant margins on which firms actively decrease labor input than measures such as the relative usage of total hours adjustment versus total employment adjustment (which include both increases and decreases in labor input). In particular, the latter measures include labor turnover that occurs through hiring and voluntary separations, which are important components of labor adjustment, but which are not of primary importance for predicting firms' response to changes in layoff versus STW subsidies.

3. Evidence on the use of STW in the U.S.

The data used for this study are drawn from two different sets of Current Population Survey (CPS) data: the 1968-93 March Annual Demographic Files, and the 1979-93 Outgoing Rotation Group Files (for all twelve months in the year). The sample was limited to wage and salary workers age 16 and older. A worker is defined to be on STW if (a) the total number of hours worked during the survey week (at all jobs) are less than 35, (b) usual hours are greater than 35, and (c) the reason given for working less than 35 hours during the survey week is slack demand, material shortage, or plant/machine repair. Bednarzik (1980) includes only those who indicate slack work in his measure of STW. I include the other two because they also represent employer-initiated hours reductions which could be induced by demand shocks. Regardless, these two categories consistently account for less than ten percent of STW, so excluding them would not alter any of the

conclusions.

3.1. Cyclical patterns

Figure 1 graphs the rates of STW and layoffs for 1968-93 using the March data. Throughout the paper, the STW and layoff rates are calculated using the same base for the labor force: all those employed or on layoff. People unemployed for reasons other than layoff are excluded from the analysis.[5]

The incidence of STW in Figure 1 is clearly quite high relative to layoffs: only during the recession years of the 1970s and early 1980s is the layoff rate appreciably higher. Throughout the most recent recession, the STW and layoff rates were virtually identical. Moreover, as shown in Figure 2, the use of STW is concentrated in industries such as construction that heavily use layoffs.

While the incidence of STW is comparable to layoffs, total hours adjustment is comparable only to short-term layoffs. This can be seen in Figure 3 which graphs the incidence of STW and layoffs in the top panel (as a fraction of employment), and the percentage of total hours adjusted through both channels in the bottom panel. For the bottom panel, usual hours for persons on layoff had to be imputed because the CPS does not record that measure for people not with a job.[6] In both panels total layoffs are broken down into

[5] Bednarzik does not include workers on layoff when calculating the STW rate. Consequently, the rates reported here are not directly comparable to those in his study.

[6] This was done by regressing usual hours on a host of demographic variables (race, marital status, age, education) and industry and occupation dummies separately for men and women for each year.

two separate groups: those of duration less than 30 days and those of greater duration. Note that this refers to ongoing duration as of the survey date, so a significant portion of the short-term layoffs ex post will be longer than 30 days. But such a division is useful because the short-duration category undoubtedly includes a disproportionate number of layoffs that ex post will be less than 30 days.

The data in Figure 3, and throughout the rest of the paper, use the Outgoing Rotation Group files so that the numbers are indicative of employment behavior for the entire year, not just March. This limits the time series to 1979-93. However, Figure 1 clearly shows that the degree of cyclical correlation between STW and layoffs barely differs for 1968-78 versus 1979-93. So the analysis for the most recent years should provide results comparable to the earlier period. Moreover, the overall pattern in the incidence of STW and layoffs in Figure 1 and the top panel of Figure 3 are virtually identical, showing that the year-to-year movements in the two rates in Figure 1 are not contaminated by cyclical factors that are unique to March.

The graphs in Figure 3 clearly show that (a) the incidence of STW is comparable to all layoffs, even exceeding them since 1987, yet (b) total hours adjustment through STW is only a fraction of total hours adjustment through layoffs. This is not surprising when one considers the likely source of demand shocks inducing the different types of adjustment. Firms that put workers on STW or on layoff for a short period of time probably have been hit by (what are perceived to be) temporary demand shocks. In contrast, firms whose workers have been on layoff for more than a month probably have been hit by

(what are perceived to be) more permanent demand shocks. However, this suggests that STW is more likely a substitute for short-duration layoffs than for long-duration layoffs. If a firm needs to downsize permanently, providing a short-term subsidy to STW through STC should not induce the firm to retain more workers in the long run. An STC subsidy might temporarily postpone such layoffs, if at all, but Figure 3 suggests that such a postponement may be quite short.

3.2. STW by industry and by occupation

Tables 2-4 explore the pattern of STW usage by industry and by occupation. Tables 2 and 3 report incidence and hours measures for select industries and occupations by year and by month, respectively. Regardless of which measure is used, the more highly cyclical industries, such as construction and manufacturing, and the more highly cyclical occupations, such as skilled laborers, have the highest rates of STW. However, as seen in Table 3, there is a distinct seasonal pattern in STW for construction, with the highest rates in the winter months.[7] The seasonal pattern for durable manufacturing is much less pronounced. This provides further evidence that usage of STW mirrors that of layoffs.

Consolidating all the data for 1979-93, Table 4 examines which industries and occupations use STW the most. As foreshadowed by the patterns in Tables 2 and 3, the highest

[7]The seasonal pattern of STW in construction underscores the concern of STC program administrators that STC not be used to subsidize seasonal employment. However, despite this concern it is not clear whether existing STC guidelines are sufficient to prevent abuse by firms that experience predictable seasonal employment changes.

rates are for those that are the most cyclical and/or seasonal: the manufacturing, construction, mining and agriculture industries, and the skilled laborer, semi-skilled laborer, and farming occupations.

A comparison of the STW incidence versus hours rates in Table 4 can be used to assess Best's comment above about the rate of reduction of hours under STC ("...such workweek reduction appears to be ... commonly smaller than the 10 percent threshold reduction of worktime required before employees are eligible to receive benefits"). An estimate of the average hours reduction under STW is available by taking the ratio of the hours adjustment figure in column five over the employment adjustment figure in column two.[8] Doing so yields an average reduction in hours of about 30 percent for each industry and occupation. As shown in Table 5, this figure falls well within the range necessary to trigger eligibility for STC for all states with such a program.[9] So Best's statement appears to be quite wrong, at least for current STC programs.

3.3. STC versus non-STC states and partial UI

Are STC programs the reason for the existence of STW in the U.S.? In order to answer this question, Table 6 reports STW rates for states that have never had an STC program ("non-STC states") and states that have ever had an STC program ("STC states," including

[8]This figure is strictly correct only if the mean usual hours worked by STW workers is the same as for non-STW workers. It is probably a good approximation.

[9]Illinois is not included in Table 5 because its program has been discontinued. However, Illinois is included as one of the STC states in all calculations because it did have an STC program during the period 1979-93.

Illinois). The answer is clearly: no, because the STW rate has been greater for non-STC states in all years except for 1992-93. It is true that many STC programs have only been introduced recently (Table 5), so the higher rates of STW in the most recent years for the STC states may be due to the recently-adopted STC programs.[10] However. Figure 4 shows that that would be a premature conclusion: both STW and layoffs have been relatively higher in STC states in recent years, suggesting that both are correlated with other factors such as different industrial compositions in the two groups of states. So it is doubtful that usage of STC explains much of the difference in STW between STC and non-STC states. This is consistent with the commonly-held view that STC programs have been vastly underutilized in the states that have them.

One component of the UI system in each state that may explain at least part of the cross-state variation in STW is partial UI benefits. Partial UI benefits are available in all states when earnings fall below a particular threshold. However, the threshold is so low that the work week has to be reduced by at least 60 percent in most states. This fact alone indicates that the provisions for partial UI probably are not a major factor in determining STW because the average hours reduction is only half that needed to qualify for partial UI. Moreover, in most states the partial UI benefit is taxed at a 100 percent rate for any earnings above a very small amount (the "disregard" amount).

Despite the fact that partial UI probably is not generous enough to explain patterns of STW, a crude test is provided in Table 7, which breaks the non-STC states into three

[10]Note that the group of STC states includes observations for years in which some of the included states did not have an STC program (such as Kansas for 1979-88 and Washington for 1979-82).

groups: least generous, more generous, and most generous partial UI benefits. States in the first group tax partial UI benefits at a 100 percent tax rate for any earnings above either 10 percent of wages or $ 40 per week. States in the second group also tax benefits at a 100 percent tax rate for earnings over the disregard, but the disregard is higher than for the first group. The third group taxes partial UI benefits at a rate of less than 100 percent for earnings over the disregard amount, providing the most generous potential benefits through partial UI. If the partial UI programs influence the use of STW, then STW should be most prevalent among those (non-STC) states that offer the most generous partial UI benefits.

An inspection of the numbers in Table 7 reveals that this is not the case: the employment incidence of STW is virtually the same for non-STC states that have the least generous partial UI programs compared to those that have the most generous partial UI programs. Even though the number of workers on STW appears unaffected by partial UI benefit generosity, there might still be greater hours adjustment due to incentives provided by partial UI schemes to dramatically reduce the length of the work week. Yet total hours adjustment through STW is same across the different levels of partial UI benefit generosity.

3.4. Using STW to evaluate the potential impact of STC

The evidence so far suggests that current patterns of STW in the United States appear to be primarily dictated by patterns of demand shocks and production technology, not by

incentives provided through STC or partial UI. Thus the current patterns of STW and layoffs for each state should serve as a useful benchmark for researchers who wish to gauge the relative effect of proposed expansions in STC on STW and layoffs. However, doing this properly requires careful consideration of all possible factors that may affect STW, layoffs, or both, including parameters of state STC, regular UI, and partial UI programs. For example, it is possible that current STC programs have marginally increased the use of STW in the states that have introduced them. But a complete answer to this requires a determination of whether other incentives (and disincentives) to use UI and partial UI changed at the same time. Such an undertaking is beyond the scope of this paper, but should be addressed in future research.

One question that can be answered is, Where should we expect to see the highest rates of STC usage? The limited data on STC usage shows an uneven distribution across industries (Kerachsky, *et al.*, 1985; Best and Mattesich, 1980). This is not surprising given the patterns in Table 4, which show the highest rates of STW among the most cyclically and seasonally sensitive occupations. However, another explanation for the patterns in Table 4 is that workers in which the firm has invested the most training and/or who have the highest level of skills should be less likely to be put on STW; otherwise the worker on STW might take that as a negative signal about future employment at the firm and decide to look for a new job. To answer this it is necessary to disentangle industry shocks from occupational differences in the response to those shocks.

In order to sort out these effects, Table 8 presents STW rates for six major occupation

groups within the seven major industries. Within each industry group, the more highly skilled management and professional occupations have the lowest rates of STW, which is consistent with firms wanting to protect investment in specific human capital. The clerical/administrative support occupation also has very low rates of STW, though always higher than managers. This probably reflects the fact that they embody less firm specific human capital, yet work side-by-side with management, and so are slightly shielded from STW because of the direct support role they play to those workers least likely to be subject to STW. Moreover, the highest rates of STW within each industry are among the skilled and semi-skilled laborers. The higher overall rate for laborers as a group, relative to white collar workers, probably reflects both differences in production technology and levels of specific human capital. In particular, the higher rate of STW for semi-skilled laborers compared to skilled laborers is probably due to their lower levels of skill.

Despite the almost uniform within-industry distribution of STW across occupation, the most cyclical industries exhibit the highest rates of STW for almost all occupations. For example, clerical/administrative support workers in construction have higher rates of STW than their counterparts in services, and the same holds for each of the other occupations within these two industries. The same is true for nondurable manufacturing compared to services. However, the pattern is less clear for durable manufacturing versus services.

The patterns in Table 8 suggest that the incidence of STC will fall most heavily on cyclical industries such as construction and nondurable manufacturing. Moreover, semi-

skilled laborers, skilled laborers, and, to a lesser extent, sales-related occupations will also have relatively high rates of STC usage, regardless of the industry of employment. Obviously, analyses such as these in Table 8 are only a crude first step at predicting STC take-up rates. A definitive answer to the effects of STC at the firm level requires firm-level data such as that used in the Mathematica evaluation (Kerachsky, *et al.*, 1985). Yet STC predictions using CPS data and techniques such as those in Table 8 should serve as a useful guide for researchers wishing to do more accurate analyses of the impact of STC than have been done to date.

4. Conclusion and Policy Implications

Contrary to the impression provided by previous research, this paper has shown that short-time work in the United States is a prevalent phenomenon with or without the explicit subsidies provided by short-time compensation: The incidence of STW is comparable to that of layoffs. This means that the most likely primary impact of STC program expansion will be to subsidize those workers and firms that already use STW. The most important implication of this is that vast numbers of workers could be put on the STC roles, thereby providing "evidence" that the programs were successful at averting layoffs, without impacting the incidence of layoffs at all. The key to determining the impact of STC on layoffs is not to count the number of people on STC alone, nor even to compare the number on STC relative to the number on layoff. Rather, layoff and STW rates — in terms of both workers and total hours — under STC must be compared to what they

would have been in the absence of STC.

If the subsidy to STC is relatively large, then undoubtedly additional workers will be put on STW relative to what would have happened otherwise. However, such a subsidy would likely lead to overadjustment through STW with a less than equal decrease in adjustment through layoffs. For example, if STC leads to 100 "additional" hours of STW, layoffs may be reduced by only 50 hours, with the additional 50 hours accounted for by a reduction in total labor input that would not have occurred otherwise. The latter means a much greater distribution of the brunt of hours reduction across the work force than is necessary.

Unfortunately, the existing STC programs probably are too limited in scope to satisfactorily quantify the impact of STC on employment versus hours adjustment in the United States. However, existing patterns of STW should be used to provide baseline estimates in future STC evaluations to determine that tradeoff. Just as important, differences in the relative subsidy to layoffs between states could be used to analyze how imperfect experience rating affects firms' choice of layoffs versus short-time work. It may be that increased experience rating alone (as advocated by Hamermesh, 1978, and Burdett and Wright, 1989) could be sufficient to significantly tip the scales in favor of STW over layoffs.

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Table 1: Layoffs as a Percentage of Total Unemployment

	Incidence (in thousands)			Percentage of total unemployment	
Year	Unemployment	Job Losers	Layoffs	Job Losers	Layoffs
1968	2,817	1,070	334	38.0	11.9
1969	2,832	1,017	339	35.9	12.0
1970	4,093	1,811	675	44.2	16.5
1971	5,016	2,323	735	46.3	14.7
1972	4,882	2,108	582	43.2	11.9
1973	4,365	1,694	472	38.8	10.8
1974	5,156	2,242	746	43.5	14.5
1975	7,929	4,386	1,671	55.3	21.1
1976	7,406	3,679	1,050	49.7	14.2
1977	6,991	3,166	865	45.3	12.4
1978	6,202	2,585	712	41.7	11.5
1979	6,137	2,635	851	42.9	13.9
1980	7,637	3,947	1,488	51.7	19.5
1981	8,273	4,267	1,430	51.6	17.3
1982	10,678	6,268	2,127	58.7	19.9
1983	10,717	6,258	1,780	58.4	16.6
1984	8,539	4,421	1,171	51.8	13.7
1985	8,312	4,139	1,157	49.8	13.9
1986	8,237	4,033	1,090	49.0	13.2
1987	7,425	3,566	943	48.0	12.7
1988	6,701	3,092	851	46.1	12.7
1989	6,528	2,983	850	45.7	13.0
1990	6,874	3,322	1,018	48.3	14.8
1991	8,426	4,608	1,279	54.7	15.2
1992	9,384	5,291	1,246	56.4	13.3
1993	8,734	4,769	1,104	54.6	12.6

Source: 1996 Economic Report of the President.

Table 2: Short-time Work Rates as a Percentage of Employment and as a Percentage of Total Hours -- Disaggregated by Year

	Total labor force		Selected Industries: Construction		Selected Industries: Durable Manufacturing		Selected Industries: Public Administration		Selected Occupations: Clerical/ Administrative support		Selected Occupations: Skilled Laborers	
	% emp	% hrs	% emp	% hrs	% emp	% hrs	% emp	% hrs	% emp	% hrs	% emp	% hrs
1979	0.96	0.33	2.65	1.08	0.84	0.31	0.15	0.05	0.38	0.12	1.78	0.64
1980	1.29	0.43	3.37	1.43	1.53	0.47	0.28	0.09	0.45	0.13	2.50	0.86
1981	1.27	0.41	3.48	1.50	1.35	0.46	0.15	0.07	0.39	0.13	2.44	0.81
1982	1.69	0.52	4.37	1.68	2.58	0.73	0.16	0.06	0.74	0.21	3.52	1.15
1983	1.30	0.40	3.37	1.27	1.50	0.42	0.11	0.04	0.52	0.15	2.71	0.88
1984	1.10	0.38	2.84	1.18	1.01	0.32	0.15	0.07	0.42	0.15	2.11	0.76
1985	1.12	0.35	2.69	1.09	1.21	0.36	0.13	0.03	0.42	0.12	2.28	0.75
1986	1.07	0.33	2.75	1.11	0.94	0.29	0.16	0.05	0.44	0.12	1.96	0.69
1987	1.01	0.33	3.17	1.25	0.79	0.25	0.15	0.05	0.41	0.11	1.79	0.66
1988	1.02	0.32	2.94	1.03	0.91	0.29	0.19	0.05	0.40	0.11	1.93	0.67
1989	1.05	0.33	3.21	1.09	0.92	0.32	0.22	0.08	0.54	0.14	1.87	0.66
1990	1.13	0.35	3.47	1.33	0.95	0.31	0.15	0.05	0.46	0.14	2.02	0.68
1991	1.38	0.43	4.81	1.86	1.48	0.43	0.12	0.06	0.65	0.19	2.61	0.91
1992	1.25	0.38	4.24	1.63	1.05	0.32	0.21	0.07	0.51	0.15	2.29	0.77
1993	1.21	0.36	3.56	1.26	0.83	0.28	0.14	0.06	0.53	0.16	1.97	0.68

The STW rates were calculated over all workers plus unemployed in each category using CPS Outgoing Rotation Group data for all months in the year.

Table 3: Short-time Work Rates as a Percentage of Employment and as a Percentage of Total Hours -- Disaggregated by Month

	Total labor force		Selected Industries: Construction		Selected Industries: Durable Manufacturing		Selected Industries: Public Administration		Selected Occupations: Clerical/ Administrative support		Selected Occupations: Skilled Laborers	
	% emp	% hrs	% emp	% hrs	% emp	% hrs	% emp	% hrs	% emp	% hrs	% emp	% hrs
Jan	1.39	0.46	3.74	1.60	1.29	0.42	0.12	0.05	0.53	0.17	2.51	0.90
Feb	1.32	0.42	3.62	1.56	1.42	0.43	0.17	0.05	0.50	0.14	2.53	0.89
Mar	1.22	0.39	3.52	1.46	1.37	0.42	0.12	0.08	0.51	0.14	2.51	0.85
Apr	1.13	0.37	3.74	1.44	1.20	0.42	0.20	0.06	0.47	0.16	2.28	0.80
May	1.16	0.37	3.26	1.31	1.36	0.41	0.11	0.05	0.46	0.14	2.31	0.79
June	1.18	0.36	3.24	1.22	1.11	0.31	0.26	0.07	0.53	0.15	2.24	0.73
July	1.20	0.37	3.12	1.21	1.07	0.32	0.17	0.06	0.56	0.16	2.10	0.70
Aug	1.11	0.34	2.66	1.00	1.12	0.34	0.16	0.05	0.47	0.14	2.08	0.66
Sept	1.04	0.32	2.84	1.04	0.98	0.33	0.28	0.08	0.42	0.12	1.87	0.66
Oct	1.10	0.34	3.25	1.20	1.13	0.35	0.21	0.07	0.40	0.11	2.05	0.69
Nov	1.18	0.36	3.52	1.23	1.27	0.39	0.07	0.02	0.44	0.14	2.30	0.78
Dec	1.28	0.42	3.96	1.54	1.19	0.36	0.13	0.06	0.50	0.14	2.39	0.85

The STW rates were calculated over all workers plus unemployed in each category using CPS Outgoing Rotation Group data for 1979-93.

Table 4: Short-time Work and Layoff Rates by Industry and Occupation, 1979-93

	As a % of employment			As a % of total hours		
Industry	Layoffs ≥30 days	STW	Layoffs <30 days	Layoffs ≥30 days	STW	Layoffs <30 days
Agriculture	1.95	3.09	0.52	1.77	1.22	0.44
Mining	2.69	1.42	0.62	2.63	0.62	0.65
Construction	3.45	3.36	1.10	3.54	1.31	1.11
Durable Manufacturing	2.15	1.21	0.57	2.12	0.37	0.57
Nondurable Manufact.	1.34	2.37	0.60	1.29	0.71	0.58
Transportation	0.80	0.88	0.22	0.80	0.36	0.22
Wholesale Trade	0.72	0.74	0.18	0.68	0.26	0.16
Retail Trade	0.53	1.18	0.18	0.51	0.24	0.16
Services	0.36	0.75	0.13	0.35	0.21	0.12
Public Administration	0.26	0.17	0.05	0.25	0.06	0.06
Occupation						
Clerical/Administrat.	0.46	0.48	0.12	0.46	0.14	0.12
Skilled laborers	2.22	2.26	0.72	2.19	0.77	0.72
Educators	0.16	0.32	0.05	0.17	0.12	0.05
Farming, forestry	1.84	2.75	0.52	1.85	1.15	0.48
Medical/health	0.21	0.68	0.09	0.19	0.18	0.09
Management-related	0.27	0.29	0.04	0.27	0.11	0.04
Semi-skilled laborer	2.53	2.65	0.76	2.66	0.89	0.79
Profess. specialty, nec	0.33	0.37	0.09	0.34	0.13	0.08
Personal service	0.69	1.71	0.27	0.69	0.34	0.25
Private HH service	0.12	1.27	0.24	0.15	0.19	0.26
Protective service	0.38	0.40	0.11	0.37	0.12	0.09
Sales-related	0.43	0.89	0.14	0.43	0.19	0.12

The STW and layoff rates were calculated over all workers plus unemployed in each category using CPS Outgoing Rotation Group data for all months during 1979-93.

Table 5: Summary of Short-Time Compensation Programs*				
Participating states	Year STC began	Duration of plan before new approval required	Limits on number of weeks	Required reduction of work
Arizona	1982	1 year	26	10% to 40%
Arkansas	1985	1 year	26	10% to 40%
California	1978	6 months	[1]	at least 10%
Connecticut	1992	6 months	26[2]	20% to 40%
Florida	1984	1 year	26	10% to 40%
Iowa	1991	2 year	26	20% to 50%
Kansas	1989	1 year	26	20% to 40%
Louisiana	1986	1 year	26	20% to 40%
Maryland	1984	6 months	26	10% to 50%[3]
Massachusetts	1988	6 months	26	10% to 60%
Minnesota		1 year	52	20% to 40%
Missouri	1987	1 year	26	20% to 40%
New York	1986		20	20% to 60%
Oregon	1982	1 year	26	20% to 40%
Rhode Island	Oct 1991	1 year	26	10% to 50%
Texas	1986	1 year	52	10% to 40%
Vermont	1986	6 months[4]	26	20% to 50%
Washington	1983	1 year[4]	26	10% to 50%

* As of January 1996
[1] No limit on number of weeks, but total paid can not exceed 26 x WBA
[2] 26 week extension possible
[3] 50% maximum may be waived by Secretary
[4] or date of plan, if earlier
Sources: Virginia Employment Commission (1993) and National Foundation for Unemployment Compensation & Workers' Compensation (1996)

Table 6: Short-time Work Rates as a Percentage of Employment for States that Have Never Had an STC Program and States that Have Ever Had an STC Program

	All states	All non-STC states	All STC states	California	New York	Kansas	Missouri
1979	0.96	1.09	0.84	0.97	0.57	0.54	1.12
1980	1.29	1.48	1.13	1.34	0.73	0.86	1.24
1981	1.27	1.44	1.12	1.39	0.61	0.64	1.47
1982	1.69	1.99	1.44	1.78	0.78	0.99	1.55
1983	1.30	1.45	1.17	1.38	0.87	0.94	1.69
1984	1.10	1.27	0.96	1.03	0.67	0.70	1.16
1985	1.12	1.20	1.05	1.17	0.53	0.74	0.72
1986	1.07	1.13	1.02	1.13	0.66	1.19	1.07
1987	1.01	1.11	0.92	1.03	0.50	0.55	1.07
1988	1.02	1.01	1.01	1.21	0.55	1.10	1.58
1989	1.05	1.01	1.09	1.33	0.63	1.04	0.98
1990	1.13	1.18	1.09	1.57	0.69	0.56	1.13
1991	1.38	1.39	1.37	2.01	1.00	0.78	1.27
1992	1.25	1.10	1.36	2.17	0.96	0.45	1.52
1993	1.21	1.06	1.33	2.04	1.10	0.87	0.76

The STW rates were calculated over all workers plus unemployed in each category using CPS Outgoing Rotation Group data for all months in the year. The STC states category includes all states that have ever had an STC program, even if the program was not in existence for one or more years during 1979-93: Arizona, Arkansas, California, Connecticut, Florida, Illinois, Iowa, Kansas, Louisiana, Massachusetts, Maryland, Minnesota, Missouri, New York, Oregon, Rhode Island, Texas, Vermont, and Washington.

Table 7: Short-time Work Rates for All Non-STC States and for Non-STC States with a Partial Unemployment Insurance Program by Level of Benefit Generosity

	All non-STC states	Level of benefit generosity for partial UI program			All non-STC states	Level of benefit generosity for partial UI program		
		Least Generous	More Generous	Most Generous		Least Generous	More Generous	Most Generous
	As a percentage of employment				As a percentage of total hours			
1979	1.09	1.18	1.09	0.85	0.35	0.38	0.35	0.30
1980	1.48	1.53	1.33	1.56	0.45	0.45	0.43	0.49
1981	1.44	1.50	1.35	1.37	0.44	0.44	0.43	0.46
1982	1.99	2.18	1.82	1.72	0.56	0.60	0.55	0.51
1983	1.45	1.54	1.37	1.31	0.43	0.46	0.41	0.45
1984	1.27	1.30	1.32	1.10	0.39	0.39	0.41	0.39
1985	1.20	1.26	1.23	0.99	0.37	0.36	0.39	0.37
1986	1.13	1.08	1.33	0.97	0.36	0.33	0.42	0.32
1987	1.11	1.10	1.11	1.15	0.35	0.35	0.34	0.36
1988	1.01	1.05	0.95	0.98	0.31	0.31	0.32	0.32
1989	1.01	1.08	0.92	0.96	0.32	0.30	0.33	0.35
1990	1.18	1.28	1.05	1.11	0.34	0.37	0.33	0.29
1991	1.39	1.50	1.30	1.22	0.44	0.48	0.40	0.41
1992	1.10	1.11	1.21	0.93	0.33	0.33	0.35	0.31
1993	1.06	1.15	1.00	0.89	0.33	0.34	0.34	0.27

The STW rates were calculated over all workers plus unemployed in each category using CPS Outgoing Rotation Group data for all months in the year. The "all non-STC states" category includes all states that have never had an STC program. The "least generous" category includes Alabama, D.C., Georgia, Indiana, Maine, Mississippi, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Tennesse and Virginia. The "more generous" category includes Colorado, Delaware, Hawaii, Idaho, Nebraska, North Dakota, Oklahoma, Pennsylvania, South Carolina, South Dakota, Utah, West Virginia and Wyoming. The "most generous" category includes Alaska, Kentucky, Michigan, Montana, Nevada and Wisconsin.

Table 8: Short-time Work and Layoff Rates by Selected Industries for Selected Occupations, 1979-93

	As a % of employment			As a % of total hours		
	Layoffs ≥30 days	STW	Layoffs <30 days	Layoffs ≥30 days	STW	Layoffs <30 days
Construction						
Clerical/Admin.	1.15	0.90	0.20	1.23	0.37	0.24
Skilled laborers	3.91	3.86	1.30	4.03	1.50	1.33
Management-related	0.65	0.95	0.11	0.61	0.46	0.11
Semi-skilled laborers	5.04	4.75	1.57	5.35	1.82	1.52
Profess. specialty, nec	0.87	0.44	0.23	0.95	0.14	0.25
Sales-related	1.00	1.46	0.10	0.98	0.48	0.07
Durable Manuf.						
Clerical/Admin.	1.02	0.51	0.20	1.06	0.15	0.19
Skilled laborers	2.92	1.66	0.83	2.86	0.52	0.83
Management-related	0.45	0.14	0.06	0.44	0.06	0.06
Semi-skilled laborers	4.27	2.59	0.93	4.14	0.76	1.00
Profess. specialty, nec	0.43	0.21	0.06	0.44	0.06	0.07
Sales-related	0.51	0.22	0.08	0.45	0.12	0.07
Nondurable Manuf.						
Clerical/Admin.	0.70	0.79	0.21	0.68	0.25	0.19
Skilled laborers	1.75	3.39	0.86	1.68	1.02	0.83
Management-related	0.22	0.22	0.02	0.22	0.06	0.02
Semi-skilled laborers	2.75	3.84	1.05	2.66	1.18	1.02
Profess. specialty, nec	0.35	0.43	0.12	0.35	0.13	0.10
Sales-related	0.21	0.54	0.10	0.22	0.17	0.11

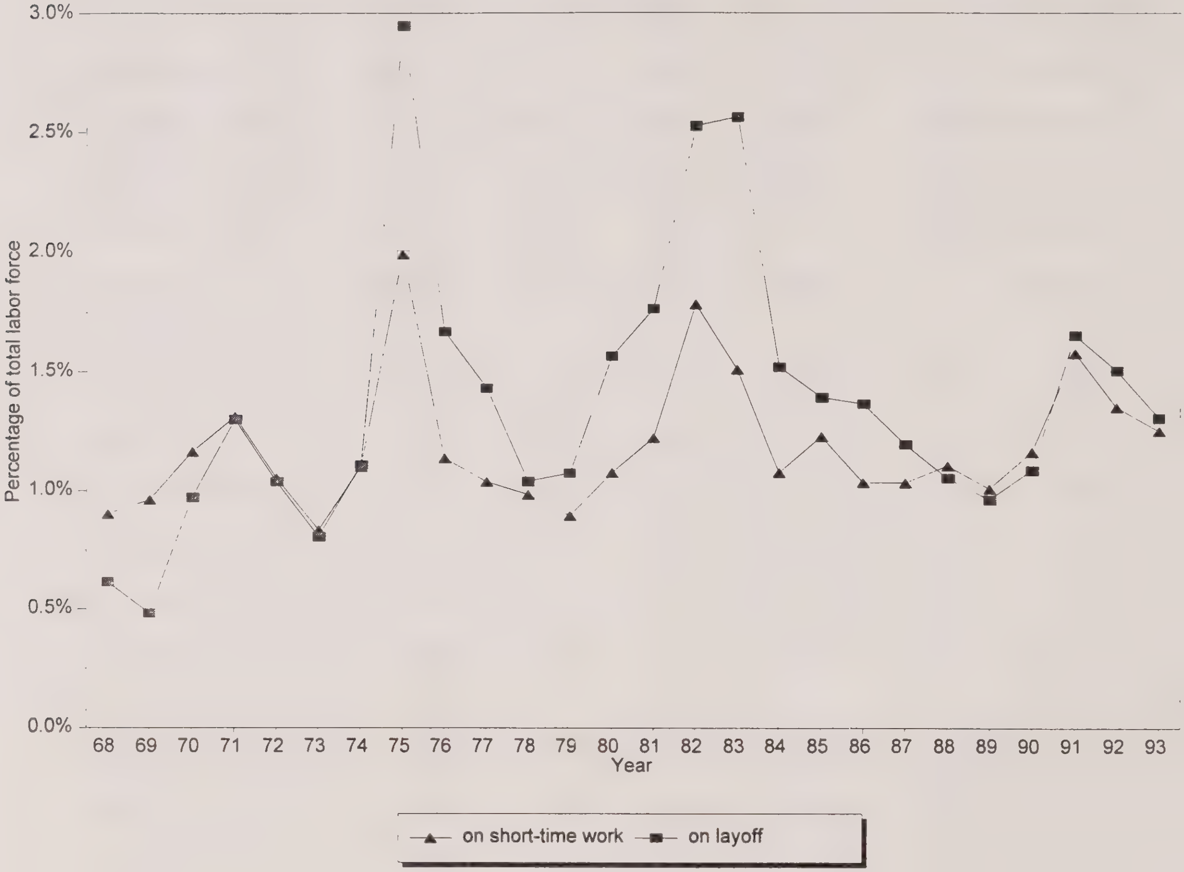
Table 8 (continued): Short-time Work and Layoff Rates
by Selected Industries
for Selected Occupations, 1979-93

	As a % of employment			As a % of total hours		
	Layoffs ≥30 days	STW	Layoffs <30 days	Layoffs ≥30 days	STW	Layoffs <30 days
Transportation						
Clerical/Admin.	0.37	0.49	0.08	0.36	0.14	0.08
Skilled laborers	1.23	1.35	0.34	1.20	0.60	0.35
Management-related	0.23	0.19	0.02	0.20	0.07	0.03
Semi-skilled laborers	2.17	2.21	0.70	2.33	0.81	0.66
Profess. specialty, nec	0.16	0.21	0.06	0.19	0.10	0.07
Sales-related	0.38	0.32	0.11	0.37	0.11	0.11
Wholesale Trade						
Clerical/Admin.	0.57	0.56	0.11	0.60	0.19	0.11
Skilled laborers	1.27	1.48	0.38	1.17	0.53	0.37
Management-related	0.29	0.23	0.02	0.31	0.09	0.03
Semi-skilled laborers	1.60	1.65	0.42	1.50	0.55	0.35
Profess. specialty, nec	0.50	0.31	0.03	0.50	0.12	0.04
Sales-related	0.40	0.32	0.07	0.40	0.13	0.06
Retail Trade						
Clerical/Admin.	0.44	0.85	0.13	0.42	0.21	0.12
Skilled laborers	0.85	1.57	0.21	0.86	0.50	0.21
Management-related	0.27	0.30	0.05	0.27	0.11	0.05
Semi-skilled laborers	0.76	1.36	0.23	0.75	0.30	0.24
Profess. specialty, nec	0.52	0.89	0.24	0.52	0.26	0.23
Sales-related	0.46	1.03	0.17	0.47	0.15	0.16

Table 8 (continued): Short-time Work and Layoff Rates by Selected Industries for Selected Occupations, 1979-93

	As a % of employment			As a % of total hours		
	Layoffs ≥30 days	STW	Layoffs <30 days	Layoffs ≥30 days	STW	Layoffs <30 days
Services						
Clerical/Admin.	0.32	0.39	0.11	0.32	0.11	0.10
Skilled laborers	0.91	1.67	0.29	0.90	0.51	0.30
Management-related	0.20	0.31	0.04	0.19	0.12	0.04
Semi-skilled laborers	1.46	2.28	0.55	1.44	0.58	0.59
Profess. specialty, nec	0.31	0.49	0.10	0.29	0.19	0.09
Sales-related	0.38	1.06	0.12	0.37	0.34	0.11

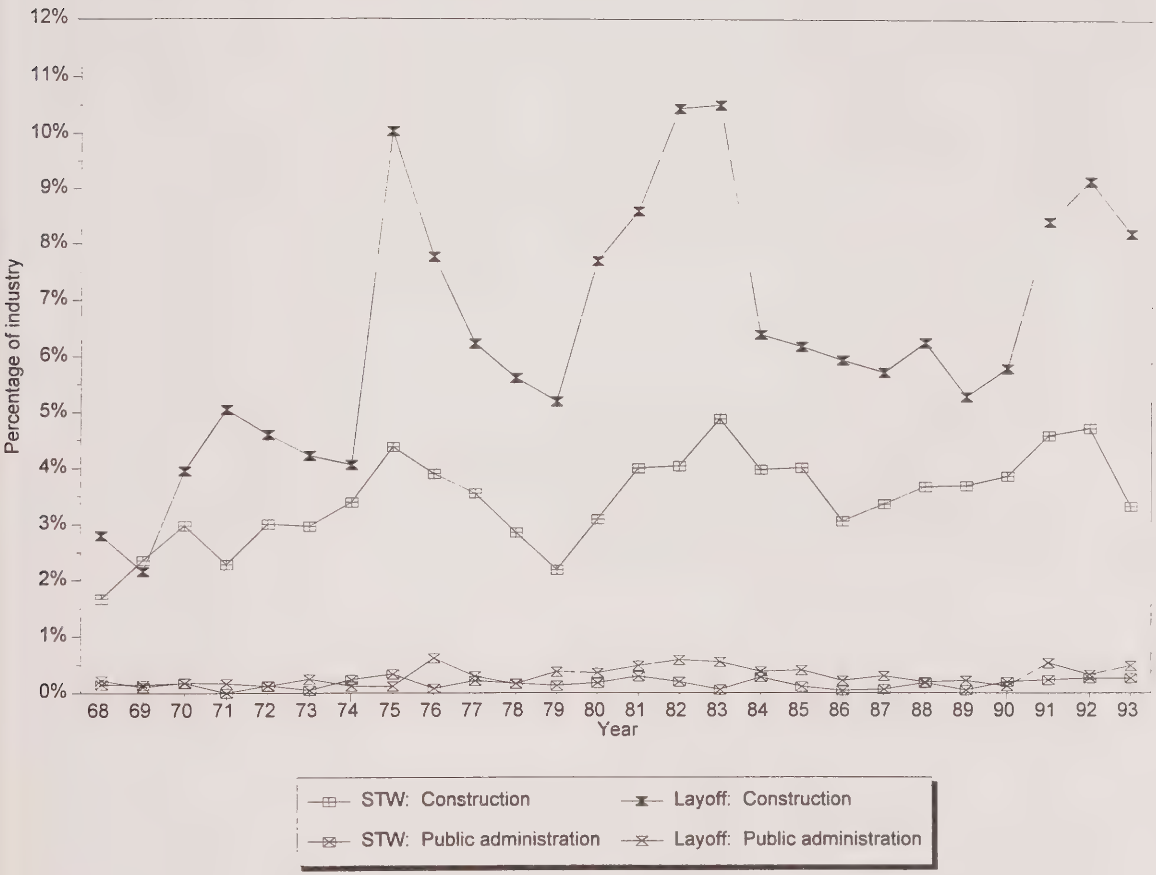
Figure 1
The Incidence of Layoffs and Short-time Work for Entire Labor Force



Source: Calculations based on March Current Population Surveys, 1968-93

Figure 2

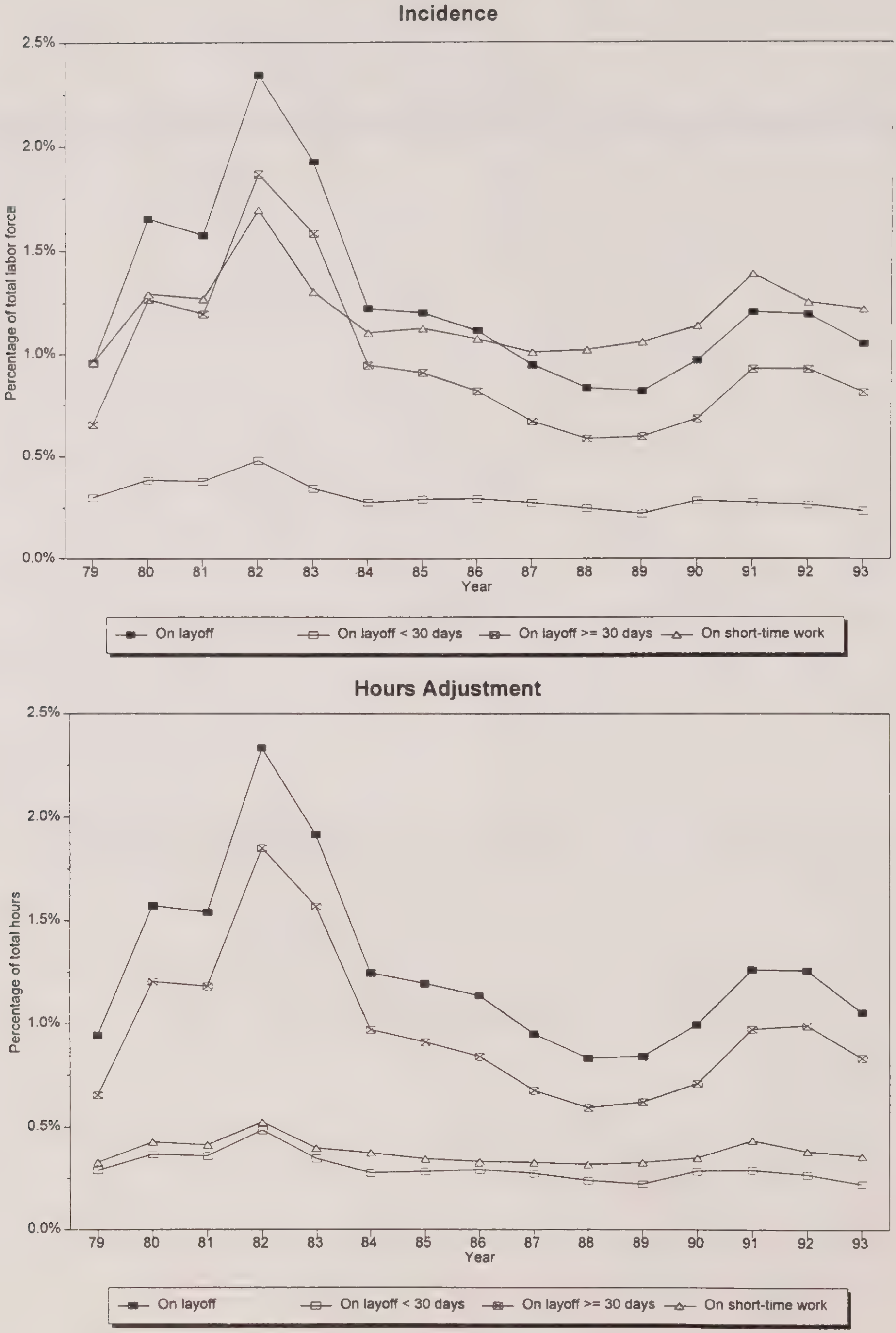
The Incidence of Layoffs and Short-time Work for Construction and Public Administration



Source: Calculations based on March Current Population Surveys, 1968-93

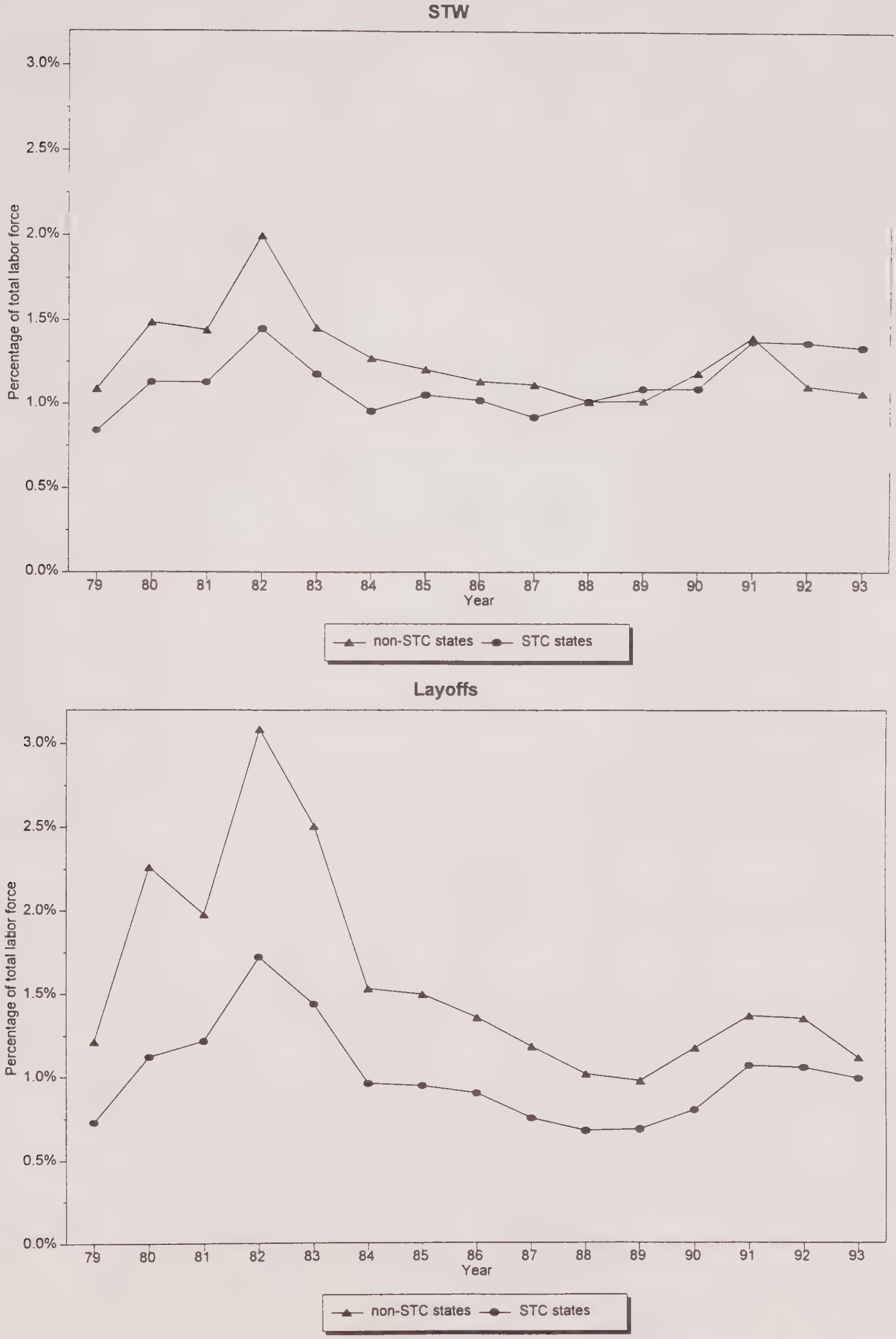
Figure 3

Layoffs and Short-time Work: Incidence versus Hours



Source: Calculations based on Current Population Surveys, Outgoing Rotation Groups (all months), 1979-93

Figure 4
Short-time Work and Layoffs for STC and non-STC States



Source: Calculations based on Current Population Surveys, Outgoing Rotation Groups (all months), 1979-93

Changes in Working Time in Canada and the United States.
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Session 4B (iv)

What is Behind the Rise in Over-Time in Canada?

Bob Billings,
Finance Canada

Conference presented by:
The Canadian Employment Research Forum (CERF)
in cooperation with:
Human Resources Development Canada,
Statistics Canada, and the
W.E. Upjohn Institute for Employment Research.

43(

What's Behind the Rise in Overtime?

Bob Billings,

Economic Analysis and Forecasting Division,

October 1995.

Many thanks to Robert Lamy for his excellent suggestions in developing this paper. Unfortunately, any errors that remain are mine. Also, the analysis in this paper does not necessarily reflect the views of my employer, Finance Canada.

Issue and Summary:

Despite continuing high levels of unemployment, the overtime share of hours has risen noticeably in the current recovery. This has led a number of groups, including the Donner Task Force, to suggest that the government should pass regulations to eliminate or reduce overtime so some work could be freed up for the unemployed. However, without a better understanding of what factors led to the growth of overtime, these regulations could create market distortions and increase labour costs without generating much if any additional employment. This note examines the potential causes of the changes in the overtime share and presents a model of overtime activity. It shows that:

- Export-oriented industries account for virtually the entire increase in overtime;

- The rise in overtime is closely linked to the auto sector's shift to just-in-time production methods;

- A structural decline in salaried workers relative to hourly-rated production workers in the export sector also lifted the employment share of workers who are more likely to work overtime; and

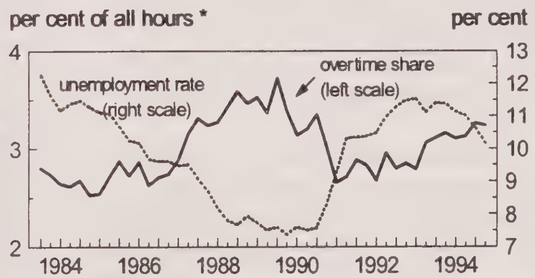
- An econometric model of overtime shows that federal payroll taxes have caused little of the rise in overtime in the export sector -- roughly as much as increases in provincial payroll taxes and firm-specific fringe benefits.

This suggests that the tools available to the federal government for influencing firms to lower overtime and increase employment are limited, for two reasons:

- General reductions in the main federal payroll taxes will have little effect; and

- Direct federal regulation reaches only the part of the work force in the federal jurisdiction, currently less than 10%.

Overtime in the Canadian Economy and the Unemployment Rate



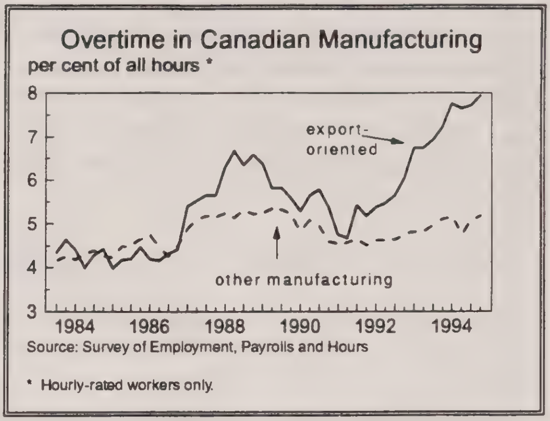
Source: Survey of Employment, Payrolls and Hours

* Hourly-rated workers only.

Background

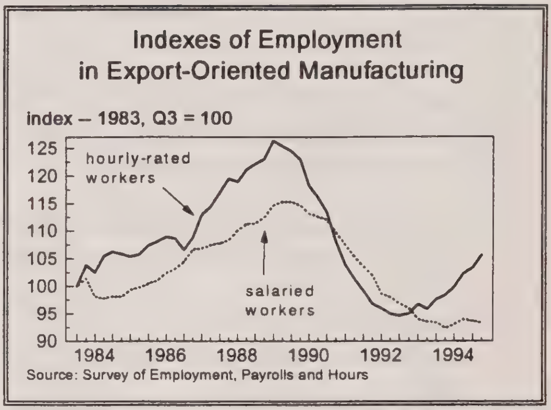
Prior to 1991, the overtime share of total hours varied inversely with the unemployment rate. Firms raised overtime when the number of qualified applicants for jobs fell as the unemployment rate rose, and vice versa. The link between overtime

and labour market tightness measures may have changed since the last recession. As a result, the share of overtime in total hours[1] rose from 2.7% in the first quarter of 1991 to 3.2% in the last quarter of 1994 despite a rise in the unemployment rate.

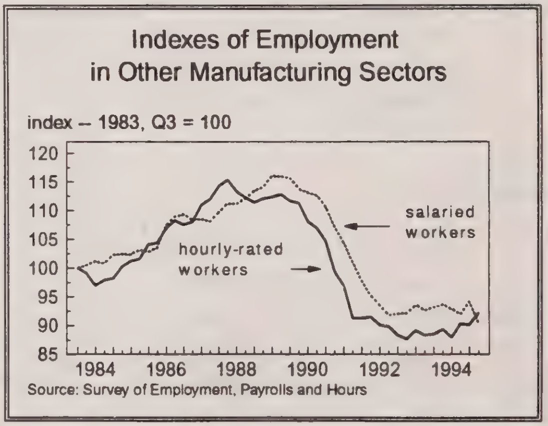


Even with the recent growth in overtime, its share of hours worked across the whole economy remains well below the pre-recessionary peak registered in mid-1989. By industry, the rise in overtime has been concentrated in the manufacturing sector. In particular, most of the increase is accounted for by export-oriented sectors, where overtime reached record levels. After falling back to near its previous trough during 1991, overtime use rose sharply in these industries and was almost eight per cent in the fourth quarter of 1994. In contrast, overtime had only a slight upward trend in other manufacturing firms.

Restructuring Issues



One factor that led to the growth in the overtime share among exporters is simply the increase in the share of the labour force that normally works overtime. Employment of hourly-rated production workers in the export-oriented manufacturers has expanded rapidly since mid-1992, but there has been no recovery in employment among salaried staff (mainly management and support staff). As a result, from the trough in the first quarter of 1991 to the fourth quarter of 1994, productivity is up one-third, but total employment fell 3.3%.



In other manufacturing industries, both hourly-rated and salaried staff have had employment losses even despite output gains since the beginning of 1991. Both groups have suffered similar employment losses since mid-1989 and have had stable employment since mid-1992 at a level roughly eight per cent below the level at the trough in output during

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[1] Data on overtime hours are available only from the Survey of Employment, Payrolls and Hours, which began in the third quarter of 1983.

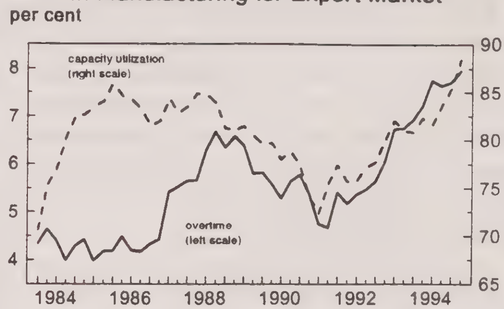
the first quarter of 1991. However, from that trough to the fourth quarter of 1994, output rose 6.2%, for a one-seventh gain in per-worker productivity over the period.

The structural change in staffing policy for exporting manufacturers led to a change in the relationship between overtime and capacity utilization. Capacity utilization for these industries was at roughly the same level in 1994 as it had been in 1986. In contrast, the overtime share almost doubled over the same period. On the other hand, the relationship between capacity utilization and overtime use does not appear to have changed much in the non-exporting manufacturers.[2]

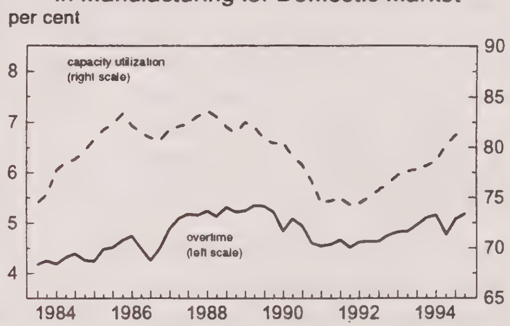
Just-in-Time Workers

The change in exporters' behaviour appears to be related to changing management techniques in the auto industry. A large share of alll manufactured exports are auto-related, and one of the most notable changes in the industry since 1983 has been the shift to just-in-time delivery of parts, as practised by the Japanese auto-makers. This has resulted in an upward drift in the ratio of shipments to inventories in the export-oriented sector as firms lower inventories relative to their production levels.[3] This ratio has also shown a similar cyclical pattern to overtime's share of total hours worked, suggesting that going to just-in-time parts delivery brings a lot of just-in-time labour demand.

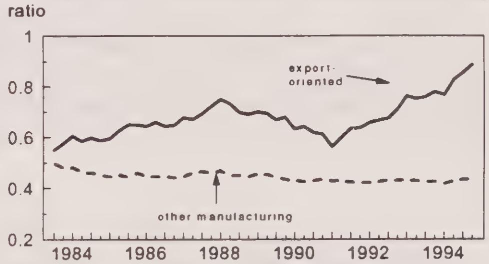
Capacity Utilization Rate and Overtime Share In Manufacturing for Export Market



Capacity Utilization Rate and Overtime Share In Manufacturing for Domestic Market



Shipments/Inventories in Manufacturing



Source: Survey of Employment, Payrolls and Hours

* Hourly-rated workers only.

2 From the chart, it appears that capacity utilization in export-oriented industries are negatively related in the 1983-1987 period and positively related from 1988 to 1994. However, regression analysis using the basic model described later in this note shows that the negative relationship held in both periods. The reason is that, as a firm approaches capacity utilization, the options for extending the hours a machine can be manned decrease, e.g. when plants put on a third production shift.

3 Readers should note that this roughly corresponds to the inverse of the inventories to sales ratio. It has been expressed in this form to conform better with the other material presented here.

Notably, the path in the ratio of shipments to inventories in the other manufacturing industries suggests that just-in-time production methods have not spread as far as in the export-oriented auto sector. For non-exporters, inventories have grown consistently over the 1983-1994 period relative to the level of shipments, decreasing the shipments/inventories ratio from .50 to .43. This drop appears to be entirely structural since the ratio is not subject to much cyclical variation.

Modelling Overtime Use

Structural models of overtime are generally based on the idea that firms use overtime to minimize costs when they face increasing demand and are constrained in hiring new employees by payroll taxes and fringe benefit systems. These factors can increase the per-hour costs of hiring new workers relative to overtime for current staff because they raise the per-unit overhead costs of labour. This occurs because payroll taxes do not apply above maximum earnings levels, and fringe benefits involve lump-sum, per-worker payments that do not vary with hours worked. However, previous work showed that paying overtime remains more expensive than hiring an additional worker to do the same work if the only non-wage costs are the federal payroll taxes: unemployment insurance (UI) and Canada Pension Plan (CPP) premiums.[4] Indeed, even workers' compensation payments cannot raise the costs of new hires into the range that overtime premiums bring to wages. As a result, other non-wage factors most likely have caused the recent increase in overtime.

Speed of adjustment models of overtime focus on two types of cost to firms as they adjust their workforce to fill product demand.[5] First, it costs money to hire and train workers quickly. Firms have difficulty finding fully competent workers quickly, and experienced workers have to mentor new employees, which detracts from their output. On the other hand, firms that do not hire enough new employees have to pay overtime rates of 50% and up.[6] Firms, therefore, try to minimize the total of these costs.

Still other explanations for overtime include:

- changes in the number of workers taking time off work due to illness;

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4 See B. Billings, "Overtime's Job Creation Potential', Analytical Note, 1994.

5 See Martin F. J. Prachowny, The Goals of Macroeconomic Policy, Chapter 3.

6 Current data suggest that the average overtime rate is about 75% above the average wage. Many employers pay 50% overtime premiums to those who work their first day off in a week and 100% to those who work their second free day, suggesting that all overtime workers put in two days of overtime per week. Since this is impossible, we must assume that people who work a lot of overtime have scarce skills for which they receive wage premia through overtime. Without specific data on overtime workers and the firms where they work, the neo-classical model of firm activity is not applicable.

- changes in the overall mix of inputs, e.g., technological change can bring new interactions between capital utilization and labour needs, as well as the mix of salaried and hourly-rated staff; and

- overall scarcity of skilled workers in the economy generally.

The rest of this paper tests these explanations in quarterly models for exporting and non-exporting manufacturers that included the following industry-specific explanatory variables: the rate of change in hourly-rated and total employment, the share of total employment accounted for by hourly-rated workers, the ratio of shipments to inventories, and the capacity utilization rate. Economy-wide variables included: the share of the work force that lost time on the job due to illness, the federal payroll taxes as a share of total worker compensation, other supplementary labour income as a share of compensation, and the national unemployment rate.

Surprisingly, the incidence of illness and the rate of employment adjustment were not significant models in either the levels or the first differences in the overtime share of total hours, suggesting that variations in overtime are not related to worker replacement due to illness. As a result, these factors are not considered in any further analysis for the sake of brevity.

Analysis

The analysis of the time-series properties of the data involved both the correlograms of the individual series and tests for stationarity. The correlogram showed that all of the remaining variables are AR(1), where the effect of innovations dampen quickly (Table A1). The tests for stationarity included both the augmented Dickey-Fuller and the Phillips-Perron tests in levels and first differences. The Phillips-Perron tests produced the clearest results (Tables A2 and A3). In levels, only two of the variables were stationary (capacity utilization in the export-oriented manufacturing sector and the shipments-to-inventories ratio for non-exporters). The first differences of all variables were stationary in a Phillips-Perron sense. The results for the ADF tests were qualitatively identical, but have not been reported.

Long-run structural relationships between overtime and the explanatory variables were tested in a model using the above models in levels. The short-term dynamic relationships were added to the long-run model by including first differences of these variables to create an error-correction model. The following long-run model was estimated for export-oriented and other manufacturing industries:

$$OT_{it} = \alpha_i + \beta_i * Inv_{it} + \chi_i * HSH_{it} + \delta_i * Util_t + \phi_i * Fed_t + \gamma_i * Other_t + \eta_i * Urate_t + \varepsilon_{it}$$

where i indexes the export-oriented and other manufacturing industries,

OT	=	the per cent of all hours accounted for by overtime,
Inv	=	the ratio of shipments to inventories,
Hsh	=	the per cent of total employment done by hourly-rated workers,
Util	=	capacity utilization in per cent,

Fed	=	federal payroll taxes (UI and CPP) in per cent of total compensation,
Other	=	other supplementary labour income in per cent of total compensation, and
Urate	=	Canada's unemployment rate in per cent.

There was a cointegrating relationship among the level of overtime in the exporting sector, the hourly-rated workers' employment share in the sector, the rates of federal payroll taxes and other supplementary income and the unemployment rate.[7] This suggests that there is a significant long-run relationship between overtime and the explanatory variables. Furthermore, for export-oriented manufacturers, the model produces reasonable estimated coefficients that have an immediate interpretation:

- the rise in the shipments-to-inventories ratio related to just-in-time production has increased just-in-time labour demand (e.g. overtime);
- the higher ratio of production to managerial workers raises the share of paid overtime in total hours worked;
- tighter labour markets lead to more overtime use; and
- increases in payroll taxes and fringe benefits increase overtime by deterring employers from hiring new workers. Federal payroll taxes had a larger effect on overtime than other forms of supplementary labour income (SLI)[8].

In contrast, the negative relationship between overtime and the capacity utilization rate was not expected. However, this likely reflects the fact that firms are more likely to draw down inventories when faced with unexpected, short-term surges in demand. Over the long run, employers would hire additional staff when they expected increases in capacity utilization.

The properties of the error correction model are also significant for two reasons:

- The estimated coefficients are roughly similar to those estimated in the long-run equilibrium model and nearly as significant in a statistical sense.
- Second, the ECM would return overtime to its long-run equilibrium path quickly, with a little more than half of any difference being offset in the following quarter.

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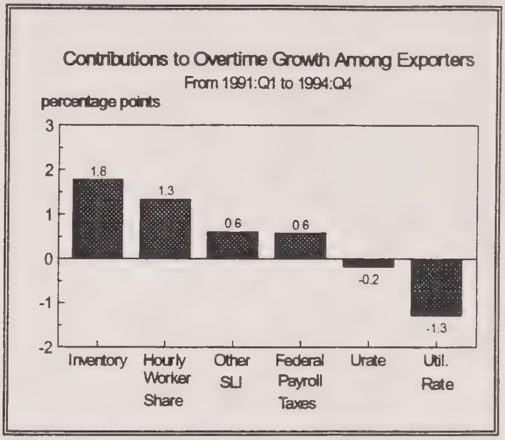
7 ADF test score 3.82 versus the required 2.63 for 1% confidence.

8 The reason for this difference is that the federal payroll taxes apply to incomes only within given bounds, while some parts of the remaining supplementary labour income do not. For example, provincial workers' compensation premiums apply in given earnings ranges, but some of the negotiated SLI is proportional to income, e.g. bonuses for performance. When charges against labour use apply only within given ranges, employers can use workers to whom the charges do not apply to save money. This opportunity is not available when the charges are proportional. It follows that only part of the non-federal SLI would be likely to promote overtime use.

Neither the levels model nor the ECM for overtime in non-exporting manufacturers has much explanatory power. According to this version, only the labour scarcity implied by the unemployment rate matters much in determining overtime.



The estimation results suggest that the changes in the ratio of shipments to inventories and the production workers' share of employment have caused most of the recent increase in overtime among export-oriented manufacturers. The rise in payroll taxes and fringe benefits was the source of about one-third of the increase in overtime, with the federal components causing about as much as fringe benefits and provincial payroll taxes combined.

Conclusions

The main point of this paper is that changes in overtime are largely a product of market forces, not federal payroll taxes or legislation. Even if intervention could be justified, the federal labour law jurisdiction does not include the sectors where overtime has increased.

Indeed, overtime is only high in the export-oriented manufacturing sector, where auto makers dominate production. As a result, the shift to just-in-time production techniques in this industry and their more limited use of salaried managerial staff (relative to hourly-paid workers) have been the main reason for the recent rise in overtime in overall hours of work.

However, the federal government has one policy tool that might be effective in limiting overtime in the auto industry. Employers can apply to the federal government for permission to pay top-ups to employees during periods of unemployment, and many firms have already received this permission. For example, the federal government uses this provision to pay top-ups to the UI benefits that its own employees receive while on maternity leave. The major firms in the auto sector also supplement UI benefits paid to their employees during periods of unemployment, bringing the income of laid-off workers to roughly the same level as those who work.

While these guarantee income security for the workers, they also hinder job creation in the sector during periods of high demand. When auto-makers face a temporary surge in demand, they have to weigh the costs of overtime against the costs of future unemployment benefit top-ups when deciding whether to hire new staff or not. Despite global over-capacity, Canada's auto industry has already passed its pre-recession peak in output due to a favourable exchange rate against the U.S. dollar and its high productivity relative to plants in other countries. However, fewer Canadians are working in the auto plants now than were on staff at the previous peak in 1989. This suggests that overall demand for labour in the global auto industry is falling, and that

the Canadian auto makers, as integrated parts of that market, are unlikely to hire staff to fill the current surge in demand.

Appendix

Table 1: Correlogram of the Variables

Variables	τ	1	2	3	4	5	6	7	8
overtime_ex	ACF	0.887	0.779	0.675	0.538	0.411	0.286	0.156	0.025
	PACF	0.887	-0.032	-0.047	-0.211	-0.054	-0.084	-0.098	-0.129
invratio_ex	ACF	0.823	0.671	0.538	0.435	0.316	0.196	0.058	-0.091
	PACF	0.823	-0.020	-0.028	0.012	-0.110	-0.089	-0.156	-0.178
hrlyshare_ex	ACF	0.881	0.747	0.596	0.436	0.279	0.129	-0.036	-0.216
	PACF	0.881	-0.130	-0.150	-0.126	-0.019	-0.087	-0.207	-0.249
caputil_ex	ACF	0.767	0.584	0.439	0.337	0.236	0.139	0.030	-0.089
	PACF	0.767	-0.011	-0.014	0.018	-0.055	-0.060	-0.122	-0.042
fedsli	ACF	0.886	0.794	0.723	0.655	0.618	0.564	0.436	0.325
	PACF	0.886	0.042	0.060	-0.014	0.117	-0.070	-0.370	-0.083
othersli	ACF	0.912	0.825	0.734	0.638	0.552	0.501	0.450	0.400
	PACF	0.912	-0.040	-0.067	-0.090	0.009	0.152	-0.029	-0.056
urate	ACF	0.940	0.862	0.779	0.435	0.316	0.196	0.058	-0.091
	PACF	0.940	-0.178	-0.072	0.012	-0.110	-0.089	-0.156	-0.178
overtime_other	ACF	0.839	0.693	0.604	0.499	0.382	0.254	0.137	-0.011
	PACF	0.839	-0.036	0.106	-0.098	-0.086	-0.136	-0.075	-0.225
invratio_other	ACF	0.793	0.677	0.502	0.410	0.365	0.329	0.328	0.249
	PACF	0.793	0.130	-0.188	0.069	0.147	0.001	0.063	-0.155
hrlyshare_other	ACF	0.778	0.700	0.501	0.380	0.329	0.285	0.269	0.270
	PACF	0.778	0.239	-0.267	-0.054	0.231	0.051	-0.058	0.079
caputil_other	ACF	0.912	0.825	0.734	0.638	0.552	0.501	0.450	0.400
	PACF	0.912	-0.040	-0.067	-0.090	0.009	0.152	-0.029	-0.056

Note: ACF represents the estimated value of the autocorrelation coefficients; PACF the estimated value of the partial autocorrelation coefficients; and τ is the number of lags.

Table A2 Phillips-Perron Test for Unit Roots

Variable in levels	Number of Lags	PP Statistic With Constant Only	PP Statistic With Constant and Trend
		Exporting Manufacturers	
overtime share	3	-0.48	1.58
	9	-0.86	-1.18
inventories ratio	3	-0.04	-0.78
	9	-0.95	-1.33
hourly share	3	-1.48	-1.41
	9	-2.51	-2.41
capacity utilization	3	-11.26*	-14.00*
	9	-2.59	-2.70
		Other Manufacturing	
overtime share	3	-2.01	-1.94
	9	-1.60	-2.05
inventories ratio	3	-3.60*	-3.58*
	9	-7.12*	-3.61*
hourly share	3	-2.00	-1.99
	9	-2.29	-1.98
capacity utilization	3	-1.77	-2.16
	9	-1.63	-2.33
		Common Factors	
federal taxes	3	-0.90	-2.11
	9	-0.59	-2.13
other sli	3	0.26	-1.85
	9	0.50	-1.75
unemployment rate	3	-1.68	-1.66
	9	-1.69	-1.74

* Denotes rejection of an hypothesized unit root with at least a 5% confidence level.

Table A3 Phillips-Perron Test for Unit Roots

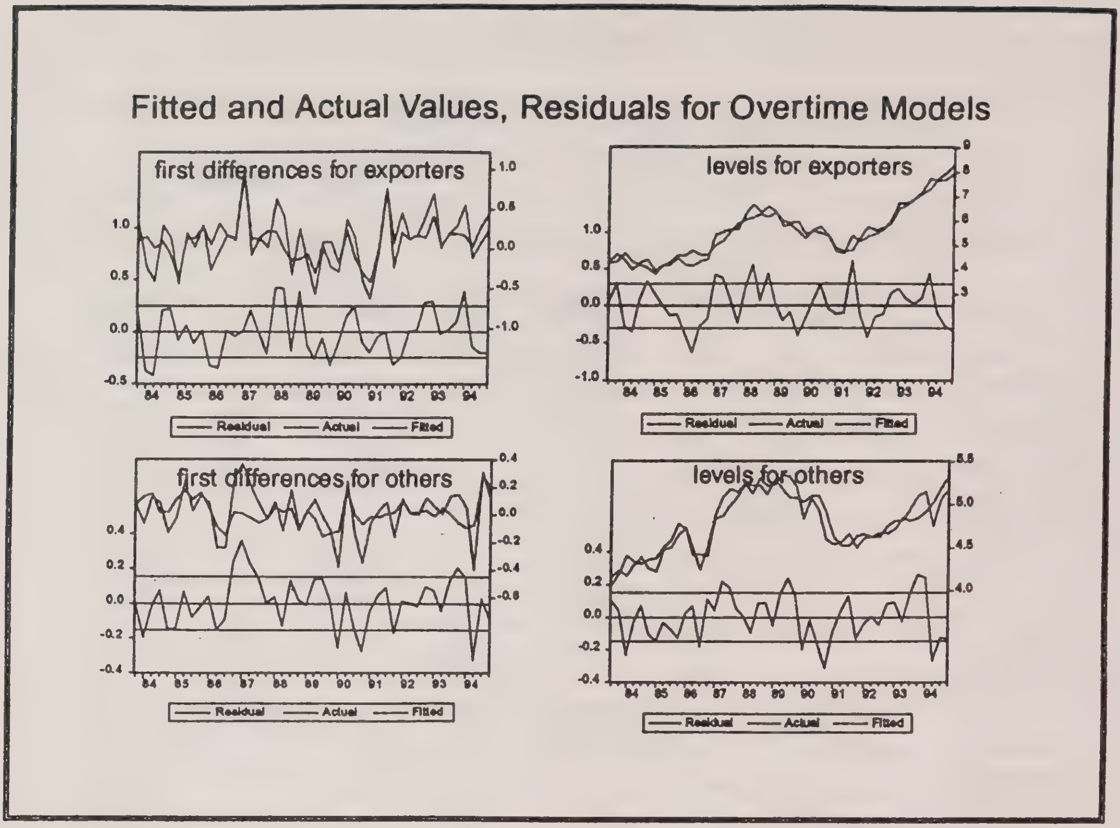
Variable in first differences	Number of Lags	PP Statistic With Constant Only	PP Statistic With Constant and Trend
Exporting Manufacturers			
overtime share	3	-6.27	-6.18
	9	-6.69	-6.15
inventories ratio	3	-9.11	-6.13
	9	-12.95	-6.25
hourly share	3	-7.24	-4.69
	9	-7.34	-8.05
capacity utilization	3	-4.08	-4.95
	9	-4.84	-4.96
Other Manufacturing			
overtime share	3	-6.62	-6.50
	9	-10.16	-6.49
inventories ratio	3	-8.17	-8.10
	9	-8.04	-8.36
hourly share	3	-3.76	-7.21
	9	-4.91	-7.11
capacity utilization	3	-4.08	-3.47
	9	-4.84	-3.63
Common Factors			
federal taxes	3	-7.29	-7.41
	9	-6.24	-5.67
other sli	3	-8.17	-7.21
	9	-8.04	-7.87
unemployment rate	3	-3.76	-3.58
	9	-4.91	-3.71

Every PP statistic would lead to the rejection of an hypothesized unit root with at least a 5% confidence level.

Table A4

Coefficients from Regression Analysis of Overtime

	Exporters		Other Manufacturers	
	Model for Levels		Model for Levels	
Parameter	**Value**	**t-Statistic**	**Value**	**t-Statistic**
α (constant)	-23.400	3.76		
β (sales/inv.)	9.250	4.28	3.710	1.60
χ (hourly share)	0.437	4.50	-0.015	0.57
δ (utilization)	-0.128	5.72	0.044	3.90
φ (federal SLI)	0.675	2.77	0.317	3.60
γ (other SLI)	0.458	2.21	0.218	2.29
η (u-rate)	-0.203	4.09	-0.199	8.70
R-Squared	0.94		0.84	
Durbin-Watson	1.31		1.41	
	Model in First Differences		**Model in First Differences**	
α (constant)	-	-	-	-
β (sales/inv.)	5.390	2.35	0.317	0.10
χ (hourly share)	0.395	2.70	0.005	0.10
δ (utilization)	-0.081	2.12	0.040	1.32
φ (federal SLI)	0.610	2.05	0.243	1.37
γ (other SLI)	0.510	1.54	0.180	0.91
η (u-rate)	-0.213	1.86	-0.147	1.86
λ (ECM param.)	-0.520	3.28	-0.634	3.48
R-Squared	0.58		0.32	
Durbin-Watson	1.65		1.56	


Fitted and Actual Values, Residuals for Overtime Models
first differences for exporters
levels for exporters
first differences for others
levels for others
Residual
Actual
Fitted

Changes in Working Time in Canada and the United States.
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Worksharing in Historical Perspective: Implications for Current Policy

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WORKSHARING IN HISTORICAL PERSPECTIVE: IMPLICATIONS FOR CURRENT POLICY

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CIRANO

Université de Montréal

May 1996

This paper seeks to explain international differences in short time and worksharing in an historical perspective. Short time has been practiced in most European countries since the nineteenth century, if not earlier; but in North America, short time, although not unknown at the end of the nineteenth century, grew less popular by the mid 1920s. Unemployment insurance legislation and collective agreements institutionalized these differences. European workers and firms have had a lot more experience with worksharing and the paper develops a learning model based on this historical record.

1. Introduction: Worksharing in Historical Perspective

In December 1993 Bell Canada and Volkswagen AG announced plans to reduce their workweek from five to four days. In both cases hour cuts were negotiated to avoid massive layoffs; at both firms earnings were cut, although not proportionately.[1] The similarities ended there, however. At Bell hour cuts were met by lower productivity and higher absenteeism, and the firm admitted that the pattern of four days work was too rigid to accommodate consumer demand (Lanoie, Raymond and Shearer 1996). At VW productivity increased, absenteeism declined, and its Wolfsburg plant now operates more than 150 schedules to accommodate the needs of workers and customers. And while in April 1994 Bell resumed working its normal 40 hour week and made plans to downsize and layoff workers, VW, as set out in its most recent contract of December 1995, continues to work 28.8 hours per week and guarantee employment security to its core workforce.

The Bell and VW cases are telling illustrations of the widespread use of worksharing and short time in Europe and its neglect in North America.[2] What

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[1] Bell Canada is a large telecommunications company employing 45,000 workers mainly in Québec and Ontario. Worksharing was introduced initially to save 5,000 jobs. The productivity and absenteeism figures cited in this paragraph are based on an unpublished study of Bell Québec's worksharing experience conducted by researchers at CIRANO. Worksharing was introduced at VW to save 30,000 of its 100,000 jobs in Germany. The firm statistics in this paragraph are based on conversations held with members of VW management and works council in June 1995.

At VW annual income was reduced proportionately, but monthly income remained roughly constant. VW workers had received previously an additional month of pay per year - the thirteenth month - but with the December 1993 agreement this amount was spread over the entire year. At Bell, average wages fell by eight to ten per cent.

[2] In the recent industrial relations literature worksharing is defined as agreements between workers and firms to reduce hours to save jobs; short time generally refers to firms' policy of cutting hours where earnings are supplemented by unemployment benefits. This convention will be followed here. Nineteenth century sources rarely mention 'worksharing', generally preferring the terms 'short time' or 'short hours.' As will be discussed below, some forms of nineteenth century short time were supplemented by local authorities, such as Poor Law assistance in Great Britain.

explains these different experiences? The literature contains two hypotheses. Abraham and Houseman (1993; see also Burdett and Wright 1989; Bernanke and Powell 1986) attribute differences in short time work to unemployment insurance rules and regulations.[3] In North America unemployed workers receive benefits but, with some exceptions, those on reduced hours do not. In Europe short time compensation is paid to workers on reduced hours. There are problems with this line of reasoning. First, at VW, as at Bell, workers on reduced hours were not subsidized. Second, even where it is practiced, there are offsetting institutional arrangements that make short time relatively unattractive in Europe. Unemployment compensation and assistance for workers who are completely laid off are more generous in Europe than North America; moreover, European employers' contributions to unemployment insurance are not experience rated (Atkinson and Micklewright 1991).

Bell and Freemen (1994) have proposed an explanation based on the observations that employed Americans work roughly 10-15% more hours than Germans, and that Americans show greater preference for additional hours worked. They attribute the differences to earnings inequality across countries, hypothesizing that Americans work longer because of the high rewards to success in the U.S., and low social safety net compared to that of Germany or other European countries. The problem with this view is that income distribution has changed over time, but the popularity of worksharing and short time in Europe, as will be discussed below, has not wavered.

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[3] Bernanke and Powell (1986) compared hour changes over the business cycle. Taking the standard deviations of the monthly growth rates of weekly hours as an indicator of variability, they found that "post war employers relied more relatively on layoffs, rather than on shortweeks to reduce labor input in downturns (p. 593)." Although Bernanke and Powell recognized that "union objective functions might be such that layoffs of a relatively small number of junior workers are preferred to a general reduction of hours...perhaps more important than unionism is the fact that in the United States, fully unemployed workers can receive government compensation but the partially unemployed cannot."

We do not dispute that at the margin more generous local, state or federal compensation would raise the amount of short-time work, nor do we question that German workers may prefer to work less because of a more expansive social safety net. This cannot be the whole story, however. Short hours have been practiced continuously in many European countries since the nineteenth century, if not earlier. When unemployment insurance legislation was written in the first decades of the twentieth century it incorporated many of the characteristics or features of short-time work already in place, including the subsidization of hours lost. But in the United States worksharing practices, although not uncommon in the mid to late nineteenth century, grew less popular by the mid 1920s, that is before the introduction of unemployment insurance legislation which ignored short-time work almost completely. The point is that not all labor markets are alike and modern institutional arrangements are manifestations of particular histories. This has important implications for policy. If institutions are endogenous, it would seem unlikely that transferring German-like labor legislation would have any significant impact in North America where the history of short-time or worksharing is limited.[4]

The historical record suggests that worksharing was associated with a particular pattern of skill formation and work organization. In many European industries it was an effective means for firms to ensure employment stability and build organizational competencies, and, for workers, and particularly apprentices, it acted as an incentive to invest in multiple skills, the classic example being the type of skills of craft or workshop production found in Germany. In North America the dominant method of production was the assembly line, and, as a result, work organization and skill formation evolved on a different path. Firms wanted to run their lines on full-time; as for workers, the

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[4] A similar point is made by Hammermesh (1995).

method of production gave them little incentive to invest in multiple skills. American workers saw hour cuts as penalizing their potential life-time income, and rather than workshare they exited to find full-time jobs elsewhere. These patterns of worksharing and short time became institutionalized well before WWII. Government legislation in Europe regularized informal worksharing arrangements between workers and firms, but in North America union contracts and the growth of personnel departments standardized the regular work week and gave legitimacy and primacy to layoffs based on inverse seniority.

An historical perspective contributes to an explanation of recent developments in working hours in Europe and North America. The process of cutting hours is not costless because both workers and firms need to expend resources to adjust to it. Thus worksharing is more common in contemporary Europe since owing to its history the fixed costs of adjustment and negotiation are lower. Moreover, the success of worksharing has contributed to a reduction in the length of the normal work week, because the learning process has affected and modified workers' preferences in Europe for leisure and work.

The paper is organized in four sections. Section two presents the stylized facts of nineteenth and early twentieth century worksharing. We focus on the British experience because of its place as the first industrialized nation and because of the availability of case studies. Section three seeks to explain how different short-time practices became institutionalized before WWII. Based on the historical record, section four proposes a simple learning model of worksharing. The model is evaluated using comparative data on hours and earnings, and workers' preferences for a reduced work week. The concluding section reexamines the Bell and VW cases in historical perspective.

2. Worksharing: The Nineteenth Century Heritage

Flexible hour arrangements have a long tradition in Europe. In the period before the first factories when work was spread through the countryside, it was common for households to divide their labor between agriculture and manufacture. Hours of work expended spinning and weaving, say, depended upon the agriculture season, as well the pressures of demand. Work would continue for seven days a week, or it could be interrupted by customary holidays and rituals. Intergenerational transfer of skills was another feature of pre-factory labor markets. Older workers shared skills and employment with their children and some recent research (Carter and Sutch 1996; Gratton 1996) claims that workers in the non-factory sector may have retired earlier than previously thought.

In the first factories that were established in Manchester and the surrounding towns in Lancashire in the late eighteenth century workers continued to mix leisure and work on the job.[5] Pre-factory work habits were difficult to break and in some cases, like metal manufacture in Birmingham, irregular hours of work persisted late into the century (Hopkins 1982).[6] But in the leading sector of textile manufacture, employers began to make investments in fixed capital equipment, such as steam engines and longer and bigger spinning machines, and as competition intensified they demanded long and regular hours of work. The representative textile factory operated at 69 hours at the beginning of the century, increasing its hours to 72 by 1830. Legislation to

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[5] For the British experience, this paper draws on material in Huberman (1996). For an excellent review of the literature on early labor markets and the transition to factory employment, see Grantham (1994).

[6] The notion of a fixed work week and a standard weekend is a recent phenomenon that only became established in Britain 1890 or so. Other countries, like France, were even slower to adopt the fixed work week and the semaine anglaise was widely scorned by both workers and firms (Cross 1989).

reduce hours was incremental. By mid-century textile firms still worked between 58 to 60 hours (a 10 1/2 -11 hour workday, Monday to Friday and 3 - 7 hours on Saturday). A standard 9 hour work day was in place by 1914; and the 8 hour day by the early twenties (Bienefeld 1972).

Why did it take so long for the normal work week to be reduced? It is difficult to believe that contemporaries did not know that long hours of work were harmful to the health and hence productivity of workers. It may be speculated that firms maintained long hours because they had difficulty monitoring the effort of their workers, and the long day ensured to some degree that goods were produced. An alternative explanation is that in the early stages of industrialization firms and workers had not made a commitment to each other. The early labor forces were heterogeneous, employing men, women and children of all ages. Firms appeared to be indifferent to the benefits of building up a stable and qualified labor force, whereas workers were unsure about their role in and uncertain about the possible benefits of industrial work. A.C. Pigou (1932, p. 466) made this point: "Except in firms which possess a practical monopoly in some department of industry, and so expect to retain the same hands permanently, the lack of durable connection between individual employers and their work people makes it to the employers' interest to work longer hours than are in the long run interest of production as a whole." Thus, in the early factories of Lancashire, the first stages of industrialization were marked by high turnover and little or no short time and worksharing.

Beginning around 1825 or so in Lancashire, that is about after one generation of factory work, both sides of the labor market began to recognize the benefits of long-term attachments (Huberman 1996). Workers had severed their link with the countryside and without the benefits of pensions or other forms of assistance when they were sick, old, or unemployed, they sought long-term

attachments. It was also at this stage of development that women and children began their retreat from the labor market and the image of the male bread winner was beginning to be fashioned.[7] From firms' perspective the high turnover policy proved to be costly. In the textile industry, spinning skills were essentially learned on the job and older workers trained newer recruits who were also their assistants. Long-term attachments encouraged workers to develop organizational competencies, allowing firms to reap the full benefits of learning by doing and to amortize their training costs and related investments in firm-specific skills.

Short time or worksharing during cyclical downturns became an important vehicle in preserving long-term attachments (Boot 1990). From around mid-century on, firms worked short hours during trade declines. Instead of a normal work week of 56 hours or so, firms cut back production, usually by about two hours a day. This amounted to a cut in production time by about 20 percent. Although hours of work remained long, there is no doubt that short time during recessions gave workers some time off to rest for the ensuing period of recovery and full-time work. The success of short-time work in Manchester and other urban centers of production during the 1840s was an important watershed. Recognizing that reduced hours did not translate into lower productivity, firms, especially those in the urban sector that had made investments in more advanced technology using steam power, supported reducing the length of the standard work week. Legislation was a means to reduce competition from firms, like factories in the countryside, that worked longer hours using water-based technologies.

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[7] It should be noted that female participation in the labor market, despite its downward trend in Europe from 1850 to 1950, has always remained higher than in the U.S. (Bairoch 1968).

The records indicate as well that short time was practiced relatively more by large firms (Huberman 1995). Recall that firms which had made large investments in machinery and equipment in the early stages of industrialization had demanded initially full-time work, regardless of the state of trade. Although work was now centralized, even in large units of production, its organization exhibited many of the traditional features of craft production. In cotton textile production there were few managers overseeing directly the key processes in spinning yarn. Work was organized on a team basis in which a senior spinner was responsible for the operation of the spinning mule, accompanied by a group of younger assistants who he supervised and trained. Younger textile workers acquired a range of skills during their training period. Spinners were paid by the piece for the output of the team which they then subdivided among its members. If firms needed to cutback outback, rather than layoff individual members of the team, they preferred to reduce hours of work to preserve the work unit and keep organizational competencies intact.

There are examples of cotton-textile firms that continued to work at full time during periods of trade decline. Not only did they work long hours but they also paid lower wages. These firms, however, earned poor reputations in the labor market and they most likely recruited low quality workers. How were reputations enforced? Short-time agreements between firms and workers were not written down and they could not be brought to a third party, like the courts. In the textile districts of Lancashire agreements well self-enforced (Huberman 1995). Notices were placed in local newspapers that announced firms breaking the norm of short time during trade declines. Over time enforcement costs declined and blacklists became less important, because population movements into the towns tapered off and workers and firms developed long-term relationships. Workers and employers lives' intersected in the factory and in the

wider community, and in this way activities of each party could be monitored by the other. But enforcement declined as well because both workers and firms acted according to what was the right thing to do, rather than because they have reckoned precisely all the consequences. Each principal feared violating the standard for fear of being ostracized, while those who did the ostracizing did so because they feared that if they do not ostracize those who violated the norms of behavior, they themselves would have been ostracized or suffered the penalty of social censure. In Manchester the social norm was do as the Mancunians do, and this meant short-time working.

Hours of work in Germany evolved similarly. Throughout the nineteenth century German firms remained small, relying on craft technologies and methods of work organization. Hours of work in these enterprises depended on the state of demand. At medium and large-sized units of operation during the early stages of industrialization, the shortage and turnover of skilled labor after the Napoleonic Wars posed a persistent problem (Lee 1978). To preserve attachments and to elicit worker investment in skills, firms encouraged apprenticeship schemes.[8] Some authors have referred to these practices as paternalistic, but there were strict economic benefits as well. Krupp initiated short time during trade recessions to give workers an incentive to undertake investments in human capital and build organizational competencies (McCreary 1968). By mid-century the German economy was well stocked with skilled labor.

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[8] From at least the middle ages until the nineteenth century, apprentices paid a fee (Lehrgeld) to their training firm. In the well-known Becker model of human capital, workers pay for general training; employers for firm-specific skills. Apprenticeship programs are thought to be a type of general training since young workers often take these skills elsewhere. But by preserving attachments, partly through short time, firms got workers to share in investments in firm-specific skills that provided them higher wages over their work cycle. Where workers and employers share in investments in firm-specific skills overall rates of return in human capital are higher.

Mirroring developments in Britain, the management techniques and work organization of craft production resurfaced in German large industry.[9] Dornseifer and Kocka (1993, p. 245-46) wrote: "[O]ccupations which had taken shape or had become more important only in the course of industrialization - casting, toolmaking, fitting or tuning - adopted features characteristic to craft production; tools remained basically unspecialized and individual skill continued to be central to the work process." The traditional mode of training, the apprenticeship program, remained intact; it may have in fact expanded. The German cotton textile industry, for example, was more highly capitalized than England's, but traditional work patterns and hours were preserved (Lenger 1988; Ritter and Tenfelde 1992).

The United States experience with worksharing has recently been explored by Carter and Sutch (1992).[10] Based on a detailed study of Connecticut manufacturing, they found that hours worked declined by more than 30 percent during the recession of 1893-94. Even those firms that reduced employment sharply relied heavily upon short time as well. But there are important differences between the European and North American cases, even at this early stage. In Connecticut short time was more pronounced at large firms employing unskilled labor. Skilled workers in the U.S. were highly mobile; many firms in fact stole skilled workers from each other (Steinfeld 1991, p. 162).[11] Moreover, apprenticeship programs in North America were not well

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[9] Recent research (Kinghorn and Nye 1996) suggests that the importance of large German has been exaggerated. The predominance of small firms and their craft techniques and work organization into the late nineteenth century strengthens the argument proposed here.

[10] See also Atack and Bateman's (1995) study of hours of operation using the U.S. censuses of manufacturing for 1870 and 1880. They find that the percent of firms on downtime in 1870 was 17.8; in 1880, 15.5.

[11] While this practice was not unknown in Europe, employers were found to have colluded to abstain from raiding other firms. We can speculate that the relatively stable population flows in many industrial communities in Europe helped enforce these arrangements. The cutlery trade of Solingen provides a classic example (Lloyd 1908). The silk industry in Lyon also used this practice.

established and workers quit without notice (Elbaum 1989). At this stage in their development American workers neither invested in skills nor built organizational competencies; rather they used mobility to improve their circumstances. Labor demand decisions matched labor supply choices. With respect to apprenticeship programs, American employers were disinterested in having contract law applied to training, because it would have limited employers prerogative to fire and discipline at will (Dan Jacoby 1992). Relative to British employers, U.S. firms were more likely to offer short-term contracts and discharge workers before their termination (Sanford Jacoby 1982). As a result, American firms began investing in technologies and work organizations that demanded fewer skilled workers (Lazonick 1990).

The British and American experiences with short time did share one common feature. Contemporaries noted that industries that paid by the piece were more likely to cut hours than employment. Chapman and Hallsworth (1907) studied this phenomenon in Britain in detail for the 1907-08 recession. In cotton textiles, where more than 75 percent of the labor force was paid by the piece, hours fell in the recession by 8.7 percent, and employment by 5.0 percent; but in the construction sector which was dominated by wage workers hours remained constant and employment fell by 6.8 percent. They concluded that the "maintenance of the standard [i.e., time] wage in time of bad trade causes displacement of labor in a degree which might otherwise be avoided...[But] in industries in which wages are paid by the piece, a shrinkage of business brings about an <u>automatic</u> [my emphasis] fall in the in the weekly rate, and thereby the reaction of the depression in dismissal of hands is to some extent avoided (p. 39)." There is nothing in principle that would have prevented firms paying by the time to cut hours, but most time payoffs in the period were based on the

weekly or daily pay.[12] Alexander Keyssar (1986) in his study of Massachusetts industry found evidence of some manufacturers shifting from time rates to piece rates during recessions.

In summary, although worksharing was common in Europe and North America prior to WWII, its characteristics differed. In industries like British and German cotton textiles and mining it was the norm of behavior in a period when employer and worker intersected in close knit communities, and like any such rule it was easier to adapt to, rather than abandoning it entirely. The rule had its origins in craft production, and particularly in Germany it fostered investments in general and specific skills. If firms and workers abandoned short time they would have needed to develop alternative ways of investing in skill formation. In this way short time became a standardized response to a decline in demand even well before the introduction of unemployment insurance. In the U.S., in contrast, craft workers were known for their mobility across firms and regions. The greater mobility impacted on the willingness of workers to invest in skills. Short time in these circumstances was seen as a luxury.

3. The Standardization of Hours

By the early twentieth century short time in Europe had evolved into a rule of thumb. Observing widespread short time during the recession of 1907 in England, the noted labor economist S.D. Chapman (Chapman and Hallsworth, 1909, p. 52) wrote: "A heavy expense is incurred, in these days of highly intricate production, when men have grown accustomed to the ways of a certain factory are permanently lost." Both sides of the labor market recognized the

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[12] Hourly pay, although not unknown in earlier periods, became widespread only after WWI in the U.S. It was slower to take hold in Europe.

potential of short hours. Trade union associations routinely supplemented short timers, the idea being to keep workers in the trade rather than tied to any specific firm.[13] During the First World War unions and firms in the textile industry strengthened worksharing provisions in negotiating an agreement to tax the revenues of the trade to subsidize short timers. These funds were administered by trade union branches.[14]

The tradition of short time in leading sectors was preserved in the unemployment insurance legislation of 1907 (Gilson 1931) and subsequent changes (Royal Commission 1931). In sectors where unions were less well organized, short timers always had recourse to Poor Law assistance administered by the municipalities. In the early and mid-nineteenth century, workers were reluctant to go the authorities for fear of acquiring a bad reputation in the labor market. But over the course of the century the stigma effect would have surely worn off and unemployment insurance of 1920 regularized this type of payment, making short-time compensation available to union and non-union members. Despite some restrictions, short time was widespread in Britain during the crises of the 1920s and 1930s.[15] Indeed the Government appealed to firms to workshare (Royal Commission 1931). In

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[13] The President of the National Union of Textile Workers concurred in 1929. Short time "keeps the skill of our people more stable" (cited in Gilson 1931, p.166).

[14] In light of its success, Ernest Bevin argued that a similar levy on goods going through the ports should be introduced to finance a minimum maintenance wage for port workers (Whiteside 1985, p. 216).

[15] The system did have its critics. Keynes (1981) in his recommendations on rationalization of the textile industry was extremely critical of short-time working because it allowed uncompetitive firms to survive. In the 1920s restrictions on the availability of benefit under short-time arrangements were introduced: if weekly earnings were half or more than the full-time week's wage, payment was denied (Thomas 1988, p. 136). The Royal Commission on Unemployment Insurance (1931, nos. 111-116) identified three drawbacks to short-time work: 1) it enabled industries to maintain a reserve fund of labor at the expense of all contributors to the Unemployment Fund; 2) it was an equivalent to a subsidy of wages; 3) many short-timers received benefits which they really did not need. Despite these drawbacks, the commission supported the principle of benefits for short-timers, "where such working represents a loss of wages."

Lancashire, where short time in the 1920s was seen to be chronic, hours of operation were cut by about 25 per cent in 1929 - or roughly by the same proportion they had been reduced in the 1840s (Whiteside 1985; Whiteside and Gillespie, 1991).[16] In textiles, as in iron and steel and shipbuilding, trade unions continued to administer the unemployment insurance funds of the central authority, and in other industries, like the shoe and hat industries, workers designed teams, often time very complex, allowing participants to receive unemployment benefits. Workers in groups of five or six arranged among themselves for one or two to "play-off" in turns, thus enabling each other to qualify for unemployment insurance benefits.[17]

Developments in Germany were similar.[18] In his detailed study of hours of work and unemployment of trade union members during the 1920s, Woytinsky (1931) reported that on average 25 percent of unionized workers were on short time during 1925 and 1926. The figure varied by sector. The maximum in textiles was 27.7 percent; in shoemaking 60 percent. Woytinsky was also concerned with the distinction in labor management practices between craft and modern industries. He found that the percentage of workers in iron and steel on short time exceeded that found in woodworking and other craft sectors. The 1927 Unemployment Act in Germany regularized short time working granting funds to workers on reduced hours. As in Britain the goal was to standardize payments across industries. Summarizing the benefits of the act,

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[16] In contrast to the early period, however, workers and firms in the 1920s opted for days-off rather than reduced hours per day.

[17] The "OXO" system in mining, so called because of the arrangement of days work (O) and days of idleness (X), was representative. The usual arrangement was three days work and three days off. The workings of the unemployment insurance scheme recognized any three days of unemployment as occurring in a period of six as continuous, and any periods of unemployment occurring within ten weeks were considered continuous. We stress the complexity of these arrangements because it has been alleged - as in the case of Bell Canada - that short time is not practical owing to the transaction costs associated with rescheduling.

[18] French unemployment insurance legislation also recognized the tradition of partage du travail (Salais, Baverez, and Renaud 1986).

Weigart (1934, p. 57) wrote: "[P]art-time employment is not penalized; instead it is encouraged."

Along with its unemployment insurance legislation, the Weimar republic legally established works councils which were optional until then (Müller-Jentsch 1995). The works council has assumed the role played by British newspapers in the nineteenth century. Throughout its history, the council has played a key role in negotiating and administering hours of work at the firm and plant levels, and monitoring and obtaining information about workers' and firms' activities. Workers who broke with short-time conventions found it difficult to find employment elsewhere; firms that did not honor commitments about short time had difficulty in recruiting workers.[19] The councils' powers as monitors and managers have increased over time as its function have expanded from being the "voice" of workers to active agents in codetermination.

In the United States short time waned in popularity before the advent of unemployment insurance legislation. Fearful of the high labor turnover that plagued the economy immediately after the end of the War, and in response to the slowing down of immigration into the country, and the growing union presence, large firms (over 250 workers) began instituting personnel or human resource departments that were given full authority over labor-management relations (Wright 1986). The professional orientation of the personnel movement facilitated its own adoption. Publicizing new techniques and bringing outside ideas into management, personnel officers made changes more acceptable to the work force. Influenced by the work of the Industrial Fatigue Board (Sargeant 1924) on the relation between long and uneven hours and fatigue, they became

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[19] Soskice (1994) makes a similar point about the mobility of apprentices. In theory apprentices who have received training are mobile between firms; in practice, the works council prevents this type of jumping. On the information gathering role of works councils, see Freemen and Lazear (1994).

proponents of a fixed or standard workweek of 40-44 hours. Standardization of hours facilitated the task of managers in supervising and monitoring the flow of throughput in enterprises that were increasingly more complex networks and dependent upon assembly production (Gordon, Edwards, and Reich 1982; Lazonick 1990; Jacoby 1993).[20] In large enterprises with rigid job assignments the substitutability of employees for hours per worker declined. Owen (1995a; 1995b) provides the most recent appraisal of the rise of personnel departments. She finds that the decline in quit rates in the 1920s was due to demand side factors, that is employer sponsored initiatives. These initiatives included internal job ladders, promotions based on tenure, deferred compensation schemes, and layoffs based on inverse seniority. The intent was to extend lengthy attachments to amortize firms' investments in specific skills.

In Europe seniority was the outcome of an implicit-type contract which promoted long-term arrangements, but in North America seniority was made explicit in contracts and formalized earlier. It was a goal in itself having advantages for both sides of the market. Seniority rules appear to be associated with the rise of mass production industries even before 1914 (Jacoby 1993). They initially were administered by foremen as a means to bolster loyalty while preserving the benefits of a trained workforce (Willard 1985, p. 244). Frequently the principle was abused, and with the rise of professional managers and the concomitant decline of the foreman, unions were able to enforce their demand that seniority be protected in collective agreements. Seniority was seen to be as equitable and as secure as any worksharing rule because it established the claims of current job holders to future job opportunities. One young electrical worker at the time observed: "I seen the guys getting laid off - fifty, sixty years old...I'm

[20] Payment by piece declined as well with standardization of hours and tasks. This had implications for short-time work. See section two above.

going to be old someday. I want security (quoted in Jacoby 1985, p. 244)." For employers, seniority provisions tied workers more closely to the firm, allowing companies to realize some of the incentive effects of an internal labor market. In these type of markets earnings were related to tenure, thereby raising the cost of quitting and dismissal. Jacoby (1991, p. 239) has argued that firms created internal labor markets in this period because of the failure of apprenticeship contracts to instill organizational competencies and in their desire to retain the employment-at-will-doctrine. By raising the cost of dismissal, firms could expect higher levels of effort.[21]

Unions in principle were not opposed to worksharing and into the 1930s there are examples of collective agreements that established work-sharing schemes. In the shoe industry in Massachusetts the collective agreement specified that jobs had to be shared or rotated among all workers who had been employed by a firm for at least five weeks. But the arrangement was temporary. A number of firms responded by repeatedly laying off workers just before they reached the 5-week mark (Keyssar 1986, p. 442). Cohen (1990, pp. 244-45) found similar malfeasance in her study of Chicago in the interwar years. Western Electric, she observed, was one of the few companies who implemented worksharing equitably during the depression, but at U.S. Steel "employees saw [worksharing] as invitation to foremen to play favorites even more than they had in the 1920s." At Bethlehem Steel, during the depression, available work was shared only among "efficient and loyal workers;" the rest were laid off (Jacoby 1985, p. 212). The experience of rubber workers was similar. Increasingly workers were gaining exposure to firms who used short time arbitrarily and

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21 Seniority thus raised the present value of jobs. As in efficiency wage models (Weiss 1990), short time reduced the value of these jobs and would imply that higher wages were required to prevent shirking. In Bulow and Summer's (1986) model the value of a job is greater to a full time worker than to a part time worker.

without any commitment to securing employment for all, and in response to President Hoover and employer groups who vigorously promoted worksharing in 1931 and 1932, many unions denounced the proposals as expedient devices to "share the misery." Thus even before World War II unions were claiming that worksharing arrangements were merely forced concessions and they fought to have contracts specify fixed workdays or workweeks (Briggs 1987).[22]

Evidence on hours of work is consistence with these business and union histories. The trend in worksharing was downward. The standard deviation of monthly growth rates of hours in manufacturing was 2.45 in the recession of 1921-23; 2.02 during the downturn of 1937-38.[23] For a more select group of steelmills, Bertin, Bresnahan and Raff (1996, pp. 255-56) found that worksharing or labor hoarding was minimal between 1929-35. They concluded that although "job sharing seems to have occurred principally at the larger firms and plants...[it] was not an economically important phenomenon."[24]

Unemployment insurance legislation at the state level gave only passing reference to short timers. At first pass, most states' legislation would appear to have encourage worksharing since contributions to the fund were experienced rated. But this does not appear to have been a concern of policy makers. Abraham Epstein (1933, p. 256), in his influential study of social insurance in the U.S. and abroad, described worksharing as a "haphazard" remedy. Some states, like Wisconsin, did make provision for unemployment compensation to

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[22] If employers' commitments about hours and seniority were broken workers would respond strategically and restrict output (Matthewson 1931), just as an efficiency wage model would predict. See footnote 21 above.

[23] Sources: Beney (1936) and Sayre (1940). Worksharing seems to have been highly concentrated in the textile sector. Oneal (1927) traces the origins of worksharing in the garment industry to European immigrant workers in the industry. Consistent with the historical argument proposed here, collective agreements in the apparel industry almost always provide for worksharing arrangements in the United States (Bureau of National Affairs 1989, p. 9).

[24] Most of the hour reduction in the steel industry was due to firms shutting down and exiting. This finding raises issue with Bernanke and Powell (1986).

part-timers, but the maximum level of combined wages and benefits they could earn could not exceed the benefits received if they were laid off completely (Common and Andrews 1936: Nelson 1969). At the federal level, President Roosevelt did show genuine interest in worksharing and hour codes stipulated by the NIRA in the mid 1930s were intended to compel firms to cut hours instead of workers. But surveying the results, Jacoby (1985, p. 237) concluded that "despite the flurry of activity...the reforms instituted in the NIRA's wake did not reach far beyond the industry's progressive minority."

In sum, well before WWII, North American and European labor markets exhibited different outcomes with respect to hours of work. Although the standard work week was established on both continents, and the average work week was in some cases longer in Europe than in North America, firms in the former offered workers lengthy employment by working short time; in the latter firms used the principle of seniority to extend attachments. These labor market arrangements were regularized and codified in European unemployment insurance legislation and in North American union contracts.

A multiple equilibria existed. Consider two different employment regimes. In the European model workers were confident that firms would honor their commitments about worksharing. Faced by a shock in demand, firms cut hours equitably and workers would resist exiting, continuing instead to share in investments in skill formation. Worksharing was a repeated outcome. If firms deviated form their traditional practice, they faced the uncertainty of workers (and other firms) responding strategically. Hence, to preserve their reputations European firms offered worksharing contracts. In North America, on the other hand, workers had no certainty about firms' commitment to workshare. The history of short time or worksharing in the U.S. was fragile at best; it had little tradition at the industry or regional level. Workers feared the possibility of a

ratchet effect (reduced hours leading to permanently lower wages or inequitable layoffs). In this regime worksharing was not a stable equilibrium.

3. Learning by Doing: The Case of Worksharing

In the classic model of learning-by-doing productivity on a given technology increases at a diminishing rate as workers become more familiar with it. There are as well dynamic aspects to learning. Learning by doing models imply that the likelihood a technology or organizational change will be exploited and improved rises with the intensity of its use. There are feedback mechanisms in this process that may led to significant externalities.

Short time or worksharing is a type of organizational change, but it has been too often analyzed from a static perspective.[25] Firms, the conventional line of reasoning argues, need to adjust work schedules and coordination costs increase. Moreover, firms may have invested in technologies that presume full-time work. Workers also need to expend resources to adjust to reduced hours. They must adjust their work-leisure schedules at the workplace and at home. In a dynamic context these costs may be less important. Through a learning process both sides of the labor market may have accumulated experience. Firms may have introduced flexible work teams, organizations and technologies that permit adjustable work schedules. Workers may have made home and life-style choices that can accommodate reduced hours. In a dynamic context in which learning takes place and which generates positive feedback mechanisms, worksharing need not raise costs. It may simply be an alternative way to organize work in the face of a downswing.

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[25] For a survey of the benefits and costs of worksharing from a static perspective, see Dreze (1987) and Owen (1989).

Table 1 reports the impact of Europe's history of worksharing on hours and earnings. Hours data are available only beginning in 1920; real earnings from 1870. All series are detrended.[26] To evaluate the comparative size of hours and earning cuts during periods of economic contraction, the table reports the size and variation of the negative residuals of the regressions. The residuals give us some idea of the comparative features of hour cuts over the period. If firms and workers adjusted hours when faced by a decline in demand, then real earnings would also vary.[27] For real earnings between 1870-1939, the range (the difference between the maximum and minimum values) of the (negative) deviations from trend are almost twice as great for Germany and France than for the U.S. and Canada. For the entire period, 1870-1985, the standard deviation of earnings is less in the U.S. than elsewhere. As for hours, the range of cuts during periods of economic contraction was larger in Europe than in North America and the standard deviations are much larger as well. The results confirm that hour variability is more common in Europe and over a long period of time.[28]

The historical record suggests an ancillary hypothesis between worksharing and the normal or standard work week. The success of short time during trade recessions in Lancashire gave workers and firms confidence that permanent hour reductions would not result in lost productivity and earnings. Both sides of the labor market had made necessary adjustments, and when legislation to reduce the length of the normal workday to 10 hours was

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26 Time squared was included in the basic regression if it was significant. Binary variables were added for the war years and the depression. Other structural forms were tested, but the results did not differ greatly. Sources are indicated in the Appendix. The British hours data are for standard and not actual hours worked.

27 In principle earnings fluctuations need to be decomposed into changes in wage rates and hours worked. For the period before 1945, however, it is difficult to get consistent and reliable series of wage rates across countries.

28 The results are consistent as well with Gordon's (1982) study of earnings and hours in Western Europe and the U.S. for the period after 1945.

introduced in 1848 it was met with little opposition (Huberman 1995). As proxied by the relation between the level of hours and changes in hours, the effect of accumulated experience of worksharing on the normal workday holds across space and time. Figure 1 reports evidence on actual hours of work for Britain during the recession of 1924 and 1925. Each point represents an industry. Those industries exhibiting more hour variability also had low normal hours of work.[29] The negative relation also shows up in Figure 2 for a group of Connecticut industries during the recession of 1893 and 1894, a period when U.S. firms did work short hours.[30] Finally, the relation holds for thirty-five industries in Germany between 1984 and 1995 (Figure 3). Those industries working a shorter (contractual) work week in 1994 exhibited the greatest fluctuation in hours of work in the period.[31]

The success of worksharing in Europe should also be revealed in workers' attitudes. When asked about their preferences about hours of work, contemporary North American workers - as did previous generations - have responded often that they would not chose a reduced week in fear that employers would interpret this as a signal of their disinterest in their job and company. If they worked fewer hours, they would be the first let go. They fear that worksharing would not be dealt with equitably. Whether or not this belief is valid or not, workers' mistrust of worksharing can be attributed, at least partly, to their unfamiliarity with it and the uncertainty of how firms would react. As a result North Americans simply prefer to work longer.[32]

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[29] Source: "Average Hours Worked," Ministry of Labour Gazette, 1927, p.251. For the underlying regression: $R^2 = 0.70$; $F = 21.16$; $p = 0.001$

[30] Source: Connecticut Bureau of Labor Statistics, Tenth and Eleventh Annual Reports for 1894 and 1895. This is the source for Carter and Sutch's (1992) study referred to above. For the underlying regression: $R^2 = 0.23$; $F = 7.04$; $p = 0.157$.

[31] Source: German Socio-Economic Panel, 1984-94.

[32] On over work in the U.S. see Schor (1991).

Bell and Freemen's (1994) study corroborates this claim. In 1989, 32.67 percent of American workers wanted to work longer at the same wage rate; 61.83 percent desired the same number of hours at the same wage; only 13.5 percent wanted to work less. On the other hand, only 13.5 percent of German workers wanted to work more; 76.41 percent the same number of hours; 10.09 less hours. The results are surprising because in 1989 the average American worked 1798 hours annually, and Germans only 1551 hours. The variation in hours over time appears to have affected and modified Germans' preferences who desire to work less and less, despite - or perhaps because of - their relatively low annual hours worked. While contractual hours of work declined in Germany from 41.81 to 38.40 between 1984 and 1994, the proportion of workers desiring to work less than 40 hours of work has increased from 54.2 to 62.7 percent.[33] Even at their low annual hours of work, Germans desire more hour cuts than Americans.

Even in North America learning from hour cuts is not unknown and workers have altered their preferences in light of their experience with reduced work time. When Bell Canada initially asked its technicians whether they would voluntary accept a cut in the work week of 8 percent with a proportional cut in earnings, only 10 percent responded favorably.[34] After its union signed a contract stipulating a reduced work week, all technicians were forced to reduce their hours. Four months later, faced by customer complaints about poor service, the company asked its technicians whether or not they wished to return to full-time work. Only 15.4 percent accepted to return to full time. In comparison with their initial preferences, the attitudes of the majority of Bell

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[33] For the underlying regression: $R^2 = 0.33$; $F = 14.89$; $p = 0.005$.

[34] The total sample was 11,534 workers.

workers had changed. Through a learning process they had come to adjust to a reduced work week.

4. Conclusion: Bell and VW in Historical Perspective

Until deregulation opened the telecommunications industry to competition, Bell Canada has remained relatively insulated from the business cycle. The tenure of its workers is long and they earn considerably above the average manufacturing wage. Their positions are protected by a collective agreement and the wage scale and promotion is based on seniority. Employees have regularly supplemented their income by overtime work. Only recently have they faced the possibility of layoffs or reduced working time. Having little or no experience with hour cuts, workers' reluctance to go on reduced time is understandable. They would have had to adjust at many margins: at home, on the journey between work and home, and on the job where they maintained the intensity of work would have increased. When the firm and the union agreed to reduce hours, employees acted strategically; they reduced effort and absenteeism increased. As for the firm and its managers, they had to expend additional resources rescheduling activities of its work teams. Although it lasted only four months, productivity in certain areas of activity improved during the experiment's last months. Representatives of the firm acknowledge that because of its steep learning curve the experiment needed more time in its implementation before assessing its full effect. Representatives also concede that if follow up surveys were now conducted, workers would show a stronger preference for reduced hours because they have had time to adjust. Still there is no further talk of worksharing. Without institutional support and lacking past practice, both management and the union are reconciled to invoking layoffs

based on inverse seniority rule, as set out in the collective agreement, and resorting to a fixed and rigid work week.

The situation at VW could hardly be more different. Unlike Bell, work at its main auto production unit in Wolfsburg is not divided into teams; in fact the plant is a model of the fordist assembly line. But despite the apparent rigidities imposed by assembly line production, firms and works have consistently worked short hours during economic contractions. During the war auto firms generally worked a shorter work week owing to shortages of parts; in the 1950s, VW was the leader among German firms in introducing a reduced work week (Tolliday 1995); and in the crisis years in the 1970s and 1980s the firm resorted to a short-time policy. Throughout the period the firm has kept its commitment to maintain and upgrade the skill level of its workers who have been guaranteed employment security. The length of the work week is flexible and both sides of the labor market seek further adjustments. Productivity at the firm has not suffered.

Bell and VW are models of two different employment regimes. The contracts between the parties represent equilibrium outcomes. The worksharing contract is the offspring of repeated negotiations in Germany over hours; the layoff contract has its origins in an industrial relations' history that is guided by a mistrust of worksharing. This form of analysis has important implications for policy. In North America attempts to modify unemployment insurance rules may alter behavior at the margin, but as long as the parties have no repeated experience with worksharing, it is difficult to believe it will be a cure for unemployment.

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Table 1. Descriptive Statistics of Deviations from Trend: Earnings and Hours.

Real Earnings

1870-1914				
	Mean	Sd	Median	Range
Canada	-0,04897	0,0385	-0,0505	0,11416
U.S.	-0,0392	0,5415	-0,01721	0,1222
France	-0,02394	0,254	-0,02364	0,0915
Germany	-0,01866	0,0178	-0,01214	0,0733

1870-1939				
	Mean	Sd	Median	Range
Canada	-0,04856	0,03292	-0,05104	0,115706
U.S.	-0,05595	0,03667	-0,05971	0,116784
France	-0,05431	0,04664	-0,04937	0,214113
Germany	-0,03734	0,05016	-0,01831	0,223481

1919-1939				
	Mean	Sd	Median	Range
Canada	-0,07991	0,074882	-0,0579	0,26169
U.S.	-0,07429	0,054181	-0,05035	0,18418
France	-0,16171	0,090431	-0,15875	0,03296
Germany	-0,17336	0,129763	-0,17449	0,391651

1870-1985				
	Mean	Sd	Median	Range
Canada	-0,16121	0,124374	-0,16546	0,415566
U.S.	-0,08708	0,077211	-0,04923	0,29488
France	-0,15685	0,117013	-0,13397	0,397343
Germany	-0,14557	0,138811	-0,10355	0,513827

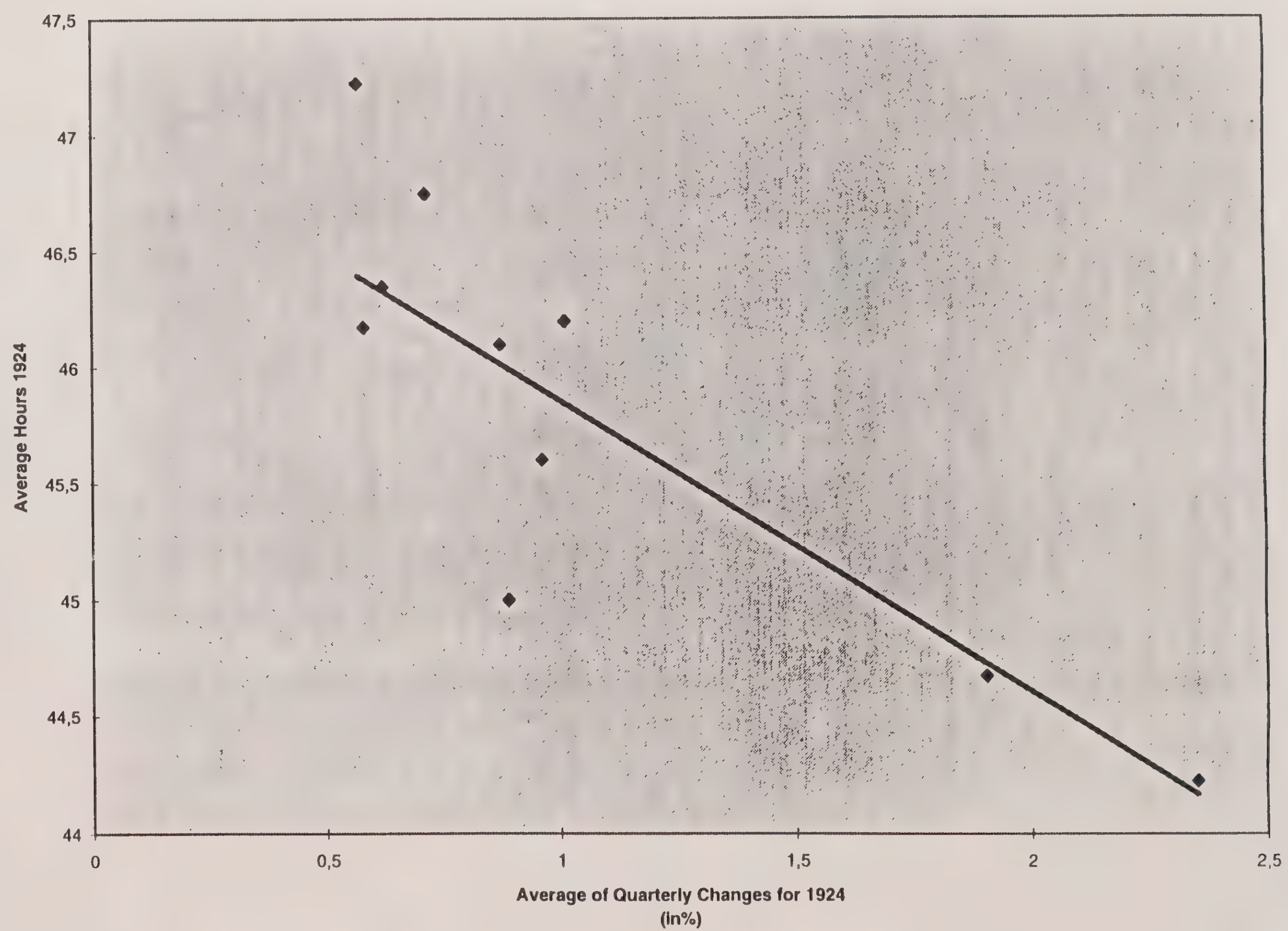
Table 1. (continued) Descriptive Statistics of Deviations from Trend: Earnings and Hours

Hours of work

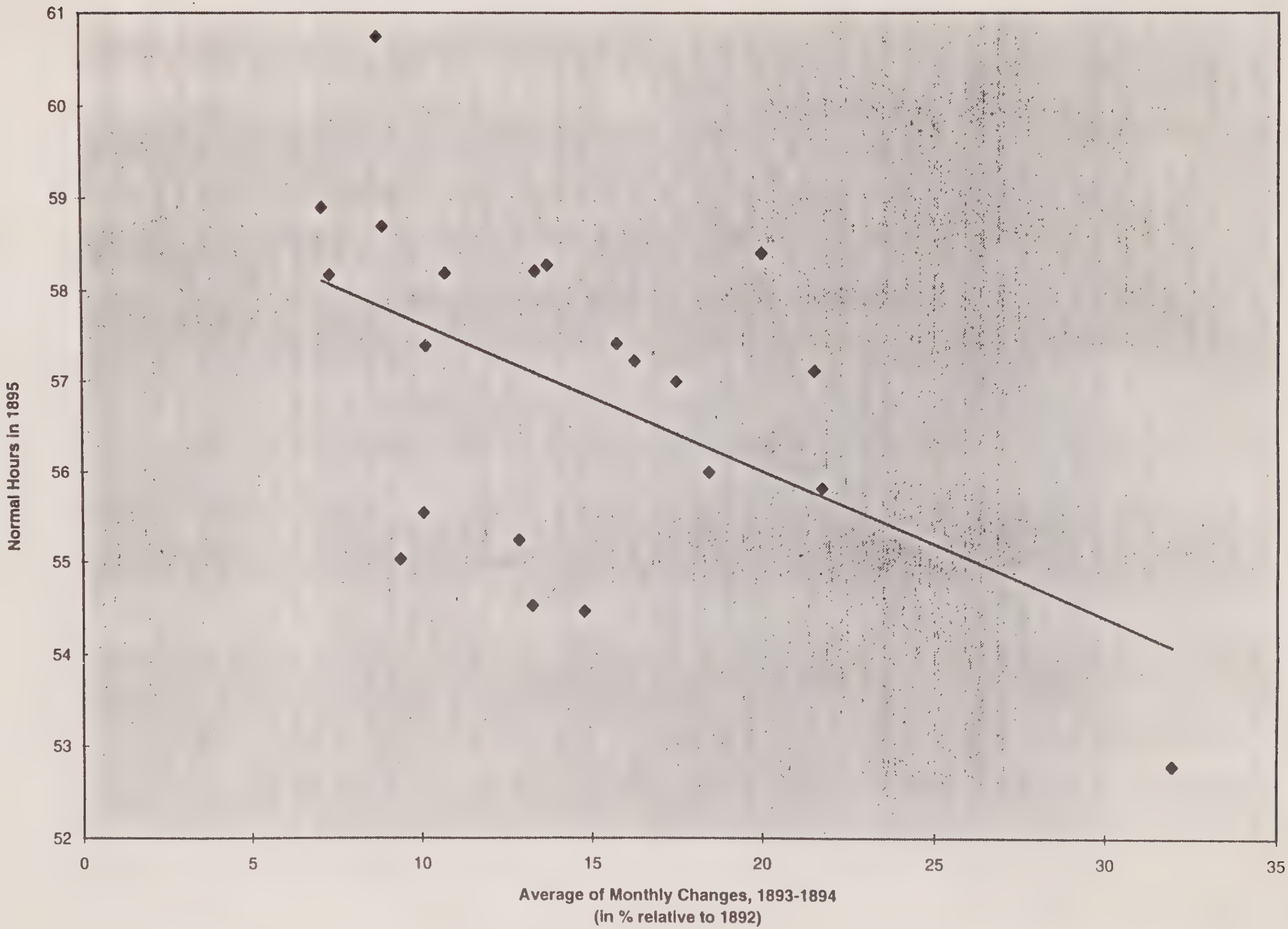
1920-1985				
	Mean	Sd	Median	Range
Canada	-0,7325	0,5365	-0,65337	1,62733
U.S.	-1,41885	1,5111	-0,82435	5,23031
France	-1,6613	1,531	-1,2421	6,1786
Germany	-1,3938	1,8909	-0,68906	7,39119

Source: See Appendix
Method of Calculation: See Text

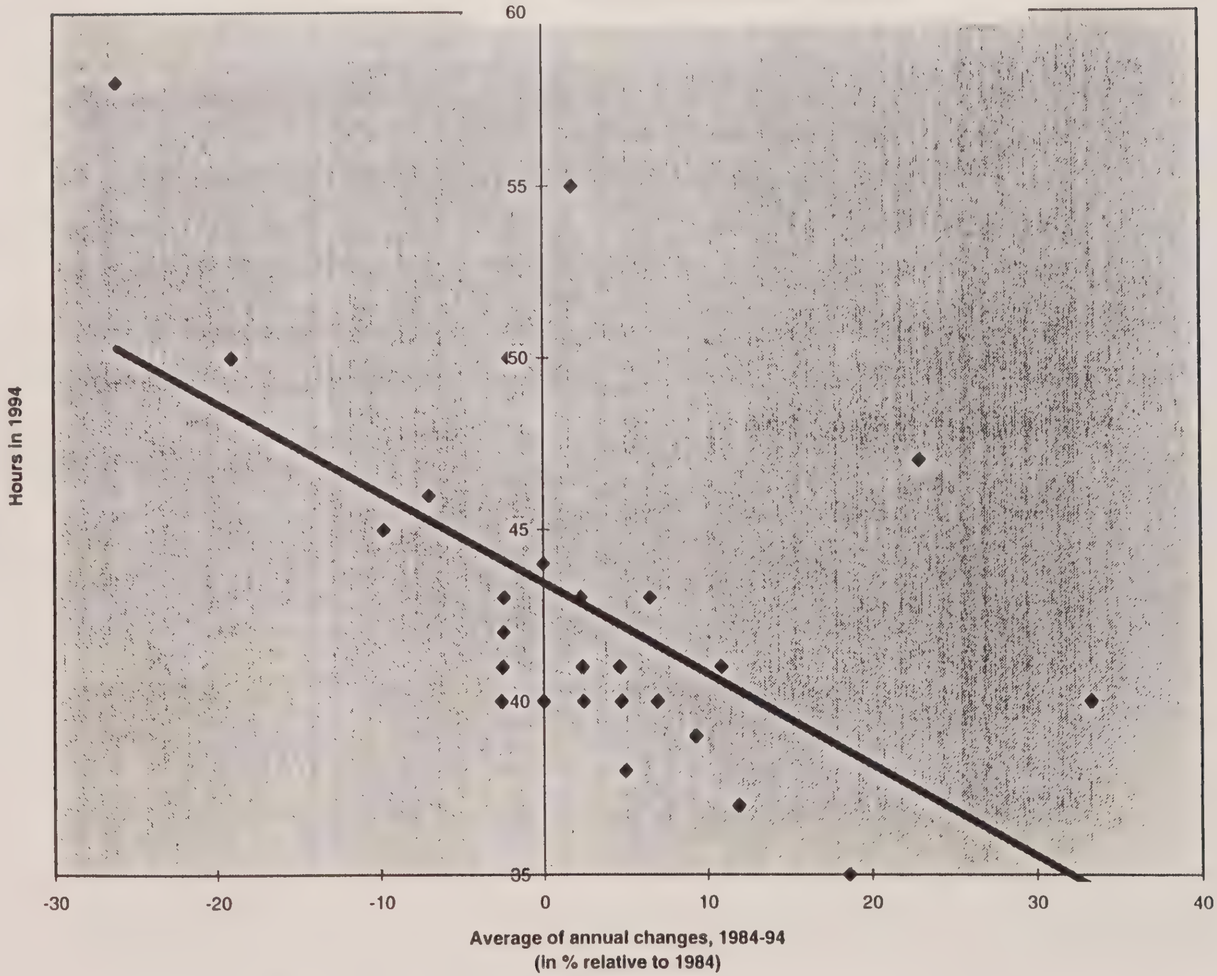
Changes in Hours of Work for 10 Industries, Great-Britain 1924



Changes in Hours of Work during the 1893-1894 Depression in Connecticut for 21 Industries



Changes in hours of work in Germany, 1984-1994
for 35 industries



Appendix for Table 1.

Real Wage

Canada France Germany Great Britain United States	1870-1985	National real wage indices; Williamson J.G., "The Evolution of global labor markets since 1830: Background evidence and hypotheses", *Explorations in Economic History*, 1995, vol.32, table A1.1 pp.164-167.

Hours of work

Canada	1932-1945	Actual hours of work per worker per week (up to 1939, excluding overtime)(excluding building); International Labor Organization, *Yearbook 1945-46*, p.85.
	1946-1950	Hours of work per week in manufacturing; International Labor Organization, *Yearbook 1949-50*, p.100.
	1951-1956	Actual hours worked per week in manufacturing; International Labor Organization, *Yearbook 1957*, p.189.
	1957-1965	Hours of work per week in manufacturing (hours paid for); International Labor Organization, *Yearbook 1966*, p.415.
	1966-1975	Hours of work per week in manufacturing (hours paid for); International Labor Organization, *Yearbook 1976*, p.501.
	1976-1985	Hours of work per week in manufacturing (hours paid for) (employees paid by the hours); International Labor Organization, *Yearbook 1986*, p.628.
France	1930-1939	Actual hours of work per worker by week (excluding building); International Labor Organization, *Yearbook 1945-46*, p.85.
	1940-1950	Hours per week in manufacturing; International Labor Organization, *Yearbook 1949-50*, p.100.

Changes in Working Time in Canada and the United States.
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Session 2A (i)

Worktime and Numerical Flexibility in U.S. Manufacturing: Emerging, Dynamic Relationships and Likely Causes

Stuart Glosser, University of Wisconsin-Whitewater, and
Lonnie Golden, Penn State University

Conference presented by:
The Canadian Employment Research Forum (CERF)
in cooperation with:
Human Resources Development Canada,
Statistics Canada, and the
W.E. Upjohn Institute for Employment Research.

WORKTIME AND NUMERICAL FLEXIBILITY IN US MANUFACTURING: EMERGING DYNAMIC RELATIONSHIPS AND THEIR LIKELY CAUSES

For the Conference on Changes in Working Time in Canada and the United States, June 13, 1996
Ottawa, Ontario, Canada

Sponsored by Canadian Employment Research Forum, Upjohn Institute for Employment Research, Statistics Canada and Human Resources Development Canada

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WORKTIME AND NUMERICAL FLEXIBILITY IN US MANUFACTURING: THE EMERGING DYNAMIC RELATIONSHIPS AND ITS LIKELY CAUSES

ABSTRACT

This paper investigates the extent to which adjustment patterns in average weekly hours and employment levels in manufacturing industries have changed since 1979 and why. A vector autoregression (VAR) system is specified to model the dynamic interrelationship between output, average work hours and employment variables. Impulse responses are estimated for sixteen, 2-digit manufacturing industries. We find that the magnitude of employment adjustment to a given shock in output has declined markedly after a structural break point in the VAR system at 1979. In contrast, the response of hours tends to increased slightly than in the period 1960-1978. These results imply employers now tend to increase hours rather than hiring when adjusting labor input upward. We attempt to probe various possible explanations of this emerging pattern. We explore trends in detailed industry data regarding several potential causal variables stressed in the labor demand, "flexible firm," and worktime literatures. These include net export penetration, indexes of skill, employee benefits, unionization and percentage part-time. Implications for job-creation policy and analysis of working hours will be drawn from the results.

WORKTIME AND NUMERICAL FLEXIBILITY IN US MANUFACTURING: THE EMERGING DYNAMIC RELATIONSHIPS AND ITS LIKELY CAUSES

This paper investigates the extent to which adjustment patterns in average weekly hours and employment levels in manufacturing industries have changed since 1979 and why. The first of its three sections reviews three literatures whose scope includes the analysis of adjustments in the quantity of labor input--dynamic labor demand with fixed costs of employment adjustment, deployment of labor input in the "flexible firm," and the secular trend in worktime with cyclical labor hoarding. A vector autoregression (VAR) system is specified to model the dynamic interrelationship between output and the hours and employment components of labor input. Results are presented in a third section. They are assessed in light of the interrelationships implied by each of the three literatures. The findings provide evidence that the magnitude of adjustment of labor input to a unit shock in output has changed since a structural break point in 1979. Specifically, the response of employment to a given shock in output has declined in relation to the earlier period. So to has the response of employment to a given shock in average weekly hours. We interpret these findings to suggest employers in many industries may be stepping up the degree with which they both hoard labor during cyclical downturns and hoard hours during cyclical upturns. The fourth section attempts to probe more directly various possible explanations of this emerging pattern in the hours vis-a-vis employment adjustment by industry. We will examine descriptively a set of potential explanatory variables derived from the three relevant literatures. The results will suggest whether the apparent substitution of hours for employment adjustment can be traced to changes in labor demand, industry and/or labor force characteristics. Implications for job-creation policy and analysis of working hours in the labor market are discussed in a fifth and final section.

Figure [] provides an overview of the long-term trends in the variables we will be investigating. Average weekly hours appear to be trending upwards since the trough of the 1981-82 recession. This stems primarily from the increase in average weekly overtime hours, which climbed to a record peak of over 5 hours in 1994. Over the same period, employment shrank while industrial output escalated. Simple regressions of average weekly overtime hours on a trend terms yields:

$$OTHOURS = 0.7370 + 0.0084TR_{post1979}$$
$$(0.1625) \quad (0.0005)$$
$$OTHOURS = 3.0980 - 0.0011TR_{post1960} + 0.0000081TR^2$$
$$(0.0725) \quad (0.0008) \qquad\qquad (0.0000018)$$

This illustrates a clear upward trend in hours since 1979:1, of one percent per year. The secular trend of overtime hours since 1960 depicts a slight U-shape, which also points to a recent upward trend. This motivates us to investigate more deeply the dynamic inter-relationships between hours and other, underlying causal variables.

I. Theory and Previous Research on the Flexibility of Work Hours and Employment

The first of three relevant literatures is the neoclassical analysis of labor demand. It contains two subsets, each centering on the influence of fixed costs of employment (FEC) faced by employers. One strain focuses on the effect of FEC on a firm's optimal, static ratio of hours to employment composition of labor input. The second concerns the firms dynamic adjustment of labor. The former tends to stress the influence of employee benefits (EB), which represent quasi-fixed costs to employers because they vary proportionately with changes in employment but less than proportionately with changes in hours.[1] The latter emphasizes the cost of hiring and training (HT) new employees, assumed to be positive in the skill level requirements of jobs.[2]

A basic labor demand function stemming from the conventional production function commonly used in this literature, is:

$$L_t^d = L\left(\overline{K}, \frac{w}{p}; \Sigma Q_{t-n}, t\right), \quad L = (NH) \qquad \textbf{(2)}$$

where demand for labor services is determined by the demand for output (Q) in the current and recent periods and a time trend (t) to account for the influence of labor-saving technological progress or capital-labor ratio changes, holding constant the real wage (w) rate and amount of capital services (K) employed.

There is an expansive literature investigating the speed with which either employment (N) or total quantity of labor input (NH) adjusts in the presence of employment adjustment costs. Generally, this labor demand literature investigates empirically the lagged adjustment of labor input

to changes in output and other variables, including institutional setting.[3] Most of this literature specifies an optimal employment equation that stems from the assumed cost structure of employment adjustment. A dynamic employment adjustment equation is then derived, where the dependent variable is the difference between actual and desired employment. The empirical test typically involves regressing this dependent variable on relevant lagged variables such as a measure of output,[4] past values of employment, and a host of other possible control variables. Such control variables include lagged values of relative factor prices, average weekly hours, inventory components such as unsold finished goods or unfilled orders,[5] capital utilization rates, expected (forecasted) output[6] and quasi-fixed costs of employment and a linear and quadratic trend term. The degree of labor input response to output fluctuation is typically argued to depend in the shorter term on the structure of demand or technology, while only in the longer-term on factor prices or productivity growth.[7]

The scope of such analyses varies from detailed industry to aggregate manufacturing to comparisons of national macroeconomies.[8] Cross-country comparisons focus on the role of public policies or institutions intended to enhance employment protection (EP) but heighten adjustment costs for employers. While discouraging layoffs such institutions may, quite unintentionally, dampen the degree of hiring follwing a rise in output, slowing the adjustment of employment levels. This is because they present additional firing (and thus hiring) costs.[9] For example, the institution of lifetime employment in Japan is argued to make employment more quasi-fixed over time. In addition, the availability of short-time compensation (STC) through the unemployment insurance system, which is in widespread use in Germany, induces workers to accept more variable hours. Thus, hours will tend to absorb proportionally more of the fluctuation in output.

A second relevant body of research is on the "flexible firm" and labor market flexibility.[10] Changing market conditions such as more variable market demand or downward pressure on market prices due to intensifying competition may lead firms to seek to improve either efficiency or sales by more quickly adapting its work force and work hours. Widespread adoption of such a "rapid response" human resource management strategy might raise both the size or speed of changes in employment or average hours. This represents the concepts of numerical flexibility (NF) and worktime flexibility (WF) respectively.[11]

The literature implies the intensification of global and domestic market competition is making employers consider a more comprehensive total cost (C) of labor function where cost is not only a function of the wage bill and nonwage expenses but also a function of the extent of the inflexibility of labor input in the face of variation in product demand, either due to undesired labor hoarding, unfilled vacancies or lost sales. This implies part of a firm's objective function has become to maximize the dynamic efficiency in human capital utilization, either through changes in overtime, regular or part-time worker hours, or the creation of shifts (which is not directly observable in average hours data). This concept of NF can be captured by an augmented total labor cost equation (3),

$$\begin{aligned} C_t = &(1-\alpha)(WHN)_t + \alpha\rho W(H_t - \overline{H}) + bN_t + f(HN)_t \\ &+ \lambda(\Delta lnQ_t - \Delta lnH_t) + \theta(\Delta lnQ_t - \Delta lnN_t) \end{aligned} \tag{3}$$

which includes the usual product of the wage rate (W), hours per worker (H) and employment (N) terms, with a premium wage rate (ρ) paid for the fraction of the work force on overtime (α). Cost is increasing in nonwage labor costs affixed to changes in employment such as many benefits (b), and nonwage labor costs that vary with changes in both employment and hours (f).[12] The terms λ and θ are coefficients.

An alternative role for intensifying international competition is that it may restrain sales revenues if it is driving down market prices. If profit margins are squeezed, firms may react by finding new ways to curb unit labor costs. Employers may perceive one such way is to substitute adjustments in hours for employment. A third realm of literature is comprised of analyisis of both the secular and high frequency trend of aggregate average hours.[13] Macroeconomic and forecasting research assumes movements in average hours serve as a reliable leading economic indicator because hours variation is believed to be transitory.[14] This literature distinguishes between structural and cyclical determinants of hours over time. The latter includes labor hoarding and procyclical variation in effort-intensity and its effect on productivity. The former includes labor supply forces such as the composition of the labor force.[15] One strain of this literature focuses on the behavior of overtime hours.[16] Ehrenberg and Schumann (1982) find, using data for US manufacturing, 1956 to

1977, no significant upward linear trend in aggregate average overtime hours once procyclical variation in GDP is controlled for. Nakamura (1993) also found no evidence of a secular trend in overtime hours. On the other hand, Hashimoto (1993) found with aggregate monthly data from 1967 to 1984 that overtime hours in the U.S. rose despite an effectively shrinking overtime premium.[17] Whether the trend in the overtime series in the US continues to exhibit no discernible upward tilt or phase-shift *after* 1977 is an empirical question.

The most influential work for this study is Bernanke and Powell (1986). They find average weekly hours stabilized in the 1954-82 period compared with the 1923-39 period, in twelve goods-producing (including eight 2- and 3-digit SIC manufacturing) industries. They link stabilization of hours in the post-War period to either greater macroeconomic stability or greater rigidity in labor input adjustment. They also find average work hours to be strongly coherent with the business cycle, and employment even more closely associated with the pattern of aggregate output. This cyclical coherence is greater in durable goods industries than in non-durables. However, the sensitivity of average hours to the general business cycle declines in the post-War era.

Each of the three relevant literatures yield testable hypotheses, which are not mutually exclusive: (1) If employment adjustment costs in the form of rising hiring and training costs (HT) are rising, due to skill upgrading in jobs, employers may be more reluctant to hire *and* to fire. This would weaken the extent and delay the timing of an employment response. It may also intensify hours adjustments to a shock in output to the extent hours are used as a substitute adjustment mechanism.[18] (2) stronger employment protection (EP) institutions such as collective bargaining contract clauses may also weaken or delay the timing of the employment response.[19] (3) higher employee benefit (EB) which are quasi-fixed costs might decrease and/or delay hiring during expansion phases of the cycle. In addition, EB will increase and hasten adjustment of hours during expansions. Conversely, during downturns, growing EB would decrease employment rather than hours, and hasten layoffs and delay hours reduction. (4) If numerical and worktime flexibility (NF and WF) indeed are rising, employers will vary labor input with reduced lag time and more proportionally to a given change in output demand during both phases of the business cycle. (5) If work hours are used exclusively as a transitory cyclical adjustment, its association with prior fluctuation in output *and* subsequent changes in employment should remain similar over time.

Unlike the previous literature concerning adjustment costs, we will not focus on the functional form of labor demand, the specification and appropriate number of distibuted lags, nor the (linear, nonlinear or quadratic) structure of fixed costs or overtime premia that underlie labor demand. We aim here to establish the stylized facts and not restrict ourselves to any one particular model when interpreting these patterns. In addition, we place our focus on the time-series relationship between output.and the other quantity-side variables— hours and employment. The unique contribution we attempt is to investigate and compare the degree of heterogeneity among industries and subperiods of time. Because we analyze one particular industry within one particular country, institutional differences outside the legal environment are the likely to be minor. We hope to extend previous literature computing estimates of lagged output elasticities of employment and hours in manufacturing by comparing the magnitude of employment and hours adjustment across industries and time periods.

II. Modeling Labor Input Adjustment and its Dynamic Relationship to Output

The main purpose of this paper is to estimate the dynamic response of hours and employment to an exogenous shock in output. We will observe the extent to which the response patterns conform to the testable predictions implicit in HT, EB, EP, NF and WF hypotheses. A typical production function including the composition of labor input is,

$$Q = [K^{\alpha}, N^{\beta}, \ H^{\gamma}, \begin{pmatrix} \varepsilon_r \\ \varepsilon_e \end{pmatrix}]$$

The previous literature implies there is a sequence of adjustment in labor input, which can be depicted as a recursive (Wold) system in Figure (1):

$$\Delta Q_t^d \rightarrow \Delta\varepsilon_t \rightarrow \Delta H_{t+k} \rightarrow \Delta N_{t+m} \rightarrow \Delta Q_{t+n}^s \qquad [0 \leq k \leq m \leq n], \ \ \frac{m+n}{2} > k \qquad (1)$$

Firms immediately respond to fluctuation in output demand (Q^d) by varying the average effort intensity (ɛ́) or pace of work in the concurrent period. Perhaps after some short lag (k number of

months), firms begin adjusting the number of average (or overtime) hours (H).[20] After *m* number of months, firms start hiring or laying off employees (N). These adjustments eventually alter the level of output supplied (Q^s). This is the same sequential ordering applied by Bernanke and Powell (1986). Also, it is consistent with the macroeconomic, leading indicator literature. Koch and Rasche (1988) found that hours precede output and employment by a short lag. In addition, Quandt and Rosen (1989) find little difference when Q (measured as real GDP) is treated as an exogenous or an endogenous variable when estimating labor demand or production function equations.

The dynamic relationships between Q, N and H is captured by a four equation VAR equation (1):

$$y_t = c + \Phi_1 y_{t-1} + \Phi_2 y_{t-2} + \dots + \Phi_{13} y_{t-13} + u_t$$

$$\text{where: } y_t \text{ is } (4x1),\ y_t = \begin{bmatrix} Q_t \\ H_t \\ N_t \\ W_t \end{bmatrix}, \qquad (1)$$

$$\Phi_i \text{ is } (4x4),\quad [i = 1,2,\dots,13],\ u_t \sim i.i.d.\ N(0, \Omega)$$

Each VAR is estimated using lags of thirteen months for all four variables.[21] Dynamic multiplier analysis assumes *a priori* the causal ordering of {Q, H, E, W} using a Choleski decomposition.[22] Impulse response functions trace the effect of an innovation in one variable on other variables in a VAR system. We do not focus in this study on the role of real wages (W) or earnings. We use standard errors derived from Monte Carlo simulations to construct confidence intervals to conduct a signficance test whether dynamic relationships remained stable or changed after a structural break date.[23]

The empirical estimation is unique in that it extends Bernanke and Powell's (1986) analysis of post-WWII labor markets beyond 1982, applies the VAR technique to those applying dynamic labor demand models [Abraham and Houseman (1993a), Hamermesh (1993) and van Audenrode (1994)], focuses on the heterogeniety by detailed industry rather than across countries (e.g., in EP) and employs a broader analytical framework to investigate possible candidates that can provide explanations for the patterns uncovered.

III. Results:

Response of Employment and Hours to an Output Shock

Dynamic multiplier analysis, or impulse responses, trace the effect of an innovation in one variable on other variables in a VAR system.the month-to-month path of the impulse responses for selected detailed manufacturing industries for both subperiods. Plots of the estimated orthogonalized impulse response functions of hours and employment to a unit shock in output for the aggregate, durable and non-durable manufacturing industries for the two subperiods over a 24 month horizon are displayed in Figure 3, 4 and 5.[24] These figures illustrate the the month-to-month path of the impulse responses for selected detailed manufacturing industries for both subperiods, highlighting (in bold) its peak value. Because the data are in log form, the responses of employment and output measured on the vertical axis are percentage changes. Estimates of the standard errors of the dynamic multipliers are generated by Monte Carlo simulation procedures from Doan (1992: 10.1) using 500 random normal drawings from the distribution of estimated VAR coefficients. These are used to assess the significance of the impulse response estimates in a given month following the innovation, including the its nadir or peak value.

We compare two subperiods in the time series available since 1960 based on whether a statistically significant structural change occurred in the relationship between variations in output, work hours and employment. We believe the end of 1978 is a natural cut off point for several theoretical economic and empirical reasons. We verify that a structural changes in the nature of labor input demand likely occurred in the late 1970s in the US by using Lutkepohl's (1989, 1993:159-64, 387-88) test for stationarity. It provides convincing statistical evidence that there exists a structural break point in the VAR system in 1979.[25] Figure 2 provides additional, descriptive evidence of a structural break occurring around 1979. The average correlation in log differences of trends values between industry employment (EMP) overtime hours (OTH) switched from positive (0.16) to negative (-0.11). Such correlations became negative after 1978 in a majority of 2,3,4-digit industry industries.

A reliable way to judge if the post-1978 period exhibits a significantly different response than the earlier1960-1978 period is if an impulse response changes by more than twice its standard error. Thirteen of the total sixteen industries examined, as well as all three aggregates, exhibit such a significant decline in the magnitude of the employment response to a unit shock in

output. In addition, eleven of these nineteen total exhibit a longer lag time before the peak response is reached. Seven of these occur in the manufacturing durables sub-sector.

Both the durable and nondurable aggregates and seven of the 16 detailed industries contain at least one lag period where the impulse response of hours rose significantly after 1979. Another seven industries experienced a period with an increase of at least one standard deviation above the pre-period's impulse reponse. However, this is tempered by the finding that six of the detailed industries contained an impulse response of hours to output which actually fell signficantly in size. Thus, the response of working time in the more recent period stayed about the same or rose slightly.

Taken together, the results show the ratio of the relative response of hours to employment increased significantly in every industry, with the exception of SIC #39. Thus, a marked change may have occurred in the composition of the labor input response in favor of hours at the expense of employment adjustment. In the first month following the output shock, the relative hours response gained in eighteen of nineteen total industries in the post-1979 period. Three months out, the ratio is higher in all but two industries. Six months out it is higher in all but five. Thus, we observe a dramatic change in the composition of the labor input response to a given shock in output, in favor of hours adjustments at the expense of employment adjustments.[26]

The results provide preliminary evidence regarding labor input adjustment and the various hypotheses drawn from the literatures reviewed. Keep in mind these hypotheses need not be mutually exclusive. First, it lends some credence to the hypothesis that fixed employment costs (FEC) in the form of hiring and training (HT) may account for the emerging adjustment patterns.[27] If indeed there has been a recent acceleration in skill-upgrading in production worker jobs in manufacturing, the rising hiring and training costs associated with such upskilling may be making employers more reluctant to both hire and fire. On the other hand, the importance of rising FEC's due to employee benefits (EB) cannot yet be ruled in nor out. The influence of EB would be to strengthen the response of hours and weaken the response of employment in expansions, which the data support. However, EB should also intensify the reduction of employment and weaken the response of hours during contractions. The role played by EB may simply reflect whether the number of months in the data set where output is expanding exceeds that of output contracting.[28] There is considerably less hint of an emerging transformation on the part of employers toward

adopting more numerical flexibility (NF) for their full-time work force.[29] However, there is some weak evidence that employers have been able to attain greater working time flexibility (WF).[30] Only with more direct observation of the time-series pattern of explanatory variables implied by the HT, EB and NF hypotheses, in section IV, may we begin to detect likely causes of the declining responsiveness of employment relative to hours.

Response of Employment to a Shock in Hours

The literatures reviewed above suggest work hours and employment can be either substitute or complementary forms of labor input adjustment.[31] The findings of the previous section, that hours are being used more intensively than employment to adjust labor input, imply work hours are becoming more the substitute and less the complement of employment adjustment. Business cycle research considers the average workweek in manufacturing a leading indicator and employment a coincident indicator. While hours may substitute in the immediate short-run period, the two are viewed as complements over the business cycle, with employment lagging hours adjustment. According to Layton and Moore (1989: 385), the workweek is an aspect of labor input that can be altered quickly to changing economic conditions. Popkin (1990: 65) and Klein (1990: 100) point to the relative ease with which employers can adjust labor input by varying work hours. Abraham and Houseman (1993a) argue employers can change hours more promptly and with less cost than hiring (or laying off) employees, because changing hours entails no long-run commitments and such decisions are easily reversed. Moore (1983: 83) states, "changes in the length of the workweek, by changing overtime hours or the number of part-time workers, are one of the first adjustments made when manufacturers detect a shift in demand." Thus, there is reason to believe changes in employment occur gradually following a given increase in work hours. If, however, employers now delay or postpone indefinitely the adjustment of employment, we would expect the complementary relationship between hours and employment to weaken or break down in the more recent period.

We now examine the response of employment across industries to an assumed exogenous, unit shock in hours. In addition to estimating parameters describing the dynamic relationship between average weekly hours and production worker employment for the aggregate, durable and non-durable sectors as well as sixteen 2-digit and four 3-digit manufacturing industries, we include

the same four 3-digit industries examined by Bernanke and Powell (1986)—steel (SIC 331), autos (SIC 371), leather shoes (SIC 314) and meat processing (SIC 201). The same two subperiods within the post-War era, before and after January 1979, are compared.

These are summarized in Table 1A. Table 1B identifies the peak value of the effect of a unit shock to average weekly hours (AWH) on employment for the manufacturing sector aggregate over the 24 months following the shock. It describes the path of the impulse responses and highlights (in bold) its peak value and the number of months that elapse before this peak is reached. The impulse responses of employment falls precipitously in the post-1979 period. In the pre-1979 period, the peak employment response was 0.60 percent, thirteen months after a one-percent shock to average hours. However, the peak response is less than one-half this size in the later period, only reaching 0.25 percent after 16 months for employment. The confidence intervals at the peak responses demonstrate the impulse response is significant in the pre-1979 period but not significantly different from zero in the post-1979 period.

In the durable goods manufacturing sector, a one-percent shock to hours before 1979 resulted in employment increasing by a significant 1.03 percent in the thirteenth month, four times the size of the standard error. In the more recent period, however, the same innovation to hours generates an response of only 0.45 percent in employment, not significantly different from zero. The table shows that in non-durables manufacturing the changes occurring over the two periods are less dramatic but similar. Employment peaked in the fourth month in the earlier period at almost 0.30 percent, but diminished to 0.09 and insignificant in the post-1979 period. The comparative responses differ little when using OTH rather than AWH as the innovation.[32] In sum, the aggregate manufacturing sectors experienced a considerable weakening in the dynamic relationship between hours and subsequent adjustments in employment.

Table1B summarizes the change in the impulse response estimated for the twenty total 2- and 3-digit disaggregated SIC industries. Table 1B shows that 19 of the impulse responses for employment were significant at their peak values in the period prior to 1979. However, eight of these became insignificant in the ensuing period. And in the eleven industries whose impulse response remained significantly positive after 1979, the magnitude of their estimated peak value declined in seven. Moreover, there is not one single industry in which the impulse response of

employment to a shock in hours changed from insignificant in the earlier period to significant later.[33]

The diagrams of estimated impulse responses of employment in key, selected industries are presented in Figure 6A, which displays the largest industry from Table 2, Machinery (SIC #35) and Figure 6B is one of the fastest growing industries, Printing (#27). Both figures show a similar pattern representative of several of the detailed industries — strong significance in the earlier period and marginally significant impulse responses in the later period. The Lumber industry (#24) impulse response shown in Figure 6 typifies the many industries exhibiting dramatic change between the two subperiods, which includes the Paper, Chemical Products, Transportation Equipment and Miscellaneous manufacturing industries. Figures 6D illustrates the 2-digit industry #37 (Transportation Equipment).

In summary, impulse response functions to a unit shock in average hours reveal that the capacity of the average workweek to lead employment through the entire business cycle has diminished markedly. The weakening dynamic links observed at the aggregate level occur in part because of changes within industries and in part because industries gaining as a share of total industrial production and employment are precisely those in which the leading effect of hours seems to have weakened most. In either case, a fundamental change has occurred in the dynamic response to variation in work hours. Much of the observed change, however, stems from changes occurring within industries.

Some Implications of the Findings

The findings have important implications for analysis of the role of work hours. One possible economic implication is that the recent trend rise in overtime hours and the failure of increases in average weekly hours to translate into employment gains with a short lag may point to a continuation of the anomalous "jobless recovery." Gordon (1993) and B. Moore (1995) suggest the U.S. may be in a productivity-led recovery.[34] Perry and Schultze (1993) find weak employment gains in the recovery from the 1990-91 recession coupled with a higher than expected productivity rebound. Perry and Schultze (1993: 170-71) suggest employer lags in hiring and firing, perhaps due to adjustment costs, may be creating this phenomenon, although it is may just represent a correction of end-of-expansion overhiring. A productivity-led recovery would obviate the need for additional

hiring, thus suppressing employment growth during cyclical upturns. Hill (1987) finds average productivity in manufacturing is highly negatively correlated with the employment level. This suggests employers may be able to substitute gains in productivity per employee as well for new hiring. Our findings suggest employers may be engaged in recent years in a more permanent hoarding of work hours during expansions, regardless of whether employers continue to hoard employees to the same degree as in earlier downturns.

A second implication for economics is that the findings challenge labor demand research [e.g., Whitely and Wilson (1988), Holm and Kiander (1989)] maintaining that overtime hours fluctuate cyclically around a stationary trend equilibrium. In contrast, our findings suggest overtime hours have drifted upward in recent years across a broad range of industries without signs of abating. Finally, the average workweek is one of eleven variables in the composite index of leading economic indicators used by the US Department of Commerce. The correlations analyzed in the VAR estimations suggest the average workweek may have become a less reliable leading indicator of changes (including turning points) over the entire business cycle in a coincident indicator such as the employment level.

IV. The Emerging Pattern in the Adjustment Response of Hours Relative to Employment and Potential Explanations

The above section demonstrates the magnitude of the response of employment declined relative to the response in work hours to a given change in output in the 1979-1995 as compared to 1960-1978 period in all but 3 of the 16 two-digit SIC industries analyzed. In this section, the significance and degree of change in an industry's impulse responses since the earlier period will be compared to the degree of change in proxy measures of the various, plausible explanatory factors for which there are data available.

Section I hypothesized that greater fixed employment costs (FEC) in the form of increased hiring and training costs (HT), perhaps due to skill upgrading in jobs might tend to dampen the sensitivity of employment over both cyclical upturns and downturns. Rising costs of employee benefits (EB) also is predicted to discourage employment gains during expansions. However, growth in EB would also heighten employment losses during recessions. The numerical flexibility

(NF) hypthesis maintains that the magnitude or speed of the employment response to a given change in manufacturing sector output will tend to escalate in industries where market competition has intensified, all else constant.[35] For similar reasons heightened competition may be expected to lead firms to seek greater working time flexibility (WF) as well. Moreover, stiffer price competition in particular may make firms more aggressively reduce or restrain labor costs. Those industries facing the stiffest competition from abroad may be expected to more intensely pursue cost-reducing labor input adjustment strategies.

Measuring the Relative Size of the Hours Response

Equation (2) represents a conceptual framework to observe the responsiveness of hours relative to that of employment by industry (*i*) in time period *t* for a given change in output (Q) demand:

where *I* is a vector of industry-specific characteristics. We focus on three subcomponents of *I*, for which data are available to construct proxies. The three are:[36] (1) magnitude of fixed costs of employment--the skill composition of jobs or extent of nonwage compensation expenses;[37] (2) product market conditions--such as import and export penetration ratios; (3) labor market conditions--such as union density.[38] H* represents the influence, if any, of the compositional character of the work force--proportion on part-time, shift or flexible work schedules.[39]

The first of two measures to capture the degree of change in an industry's adjustment response is a "standardized change" in employment and hours responses. It is derived from the impulse responses estimated in Section III. This statistic represents the difference in size of the impulse response between the pre- and post-1979 periods, divided by square root of the summed squares of the standard errors, through the first six months following the unit shock to output. It is therefore analagous to a t-statistic , whereby it can be compared to the standard critical values used in t-tests. Tables 3A and 3B show the value of these computed measures by 2-digit SIC industry for employment and hours respectively. These tables also rank each of the sixteen industries according to the absolute size of this statistic for the employment and hours response respectively in each step

period following the initial shock.

Table 3 display several interesting patterns worth noting. First, the employment response declines signficantly in thirteen of the sixteen total industries in the sample. In five of these industries, the decline in the employment response is coupled with an increasing response of hours after 1979. This includes SIC industries #20, 23, 24, 26 and 28. These are the particular industries where a substitution of hours for employment adjustment has developed. In addition, four other industries exhibit a decline in their employment response combined with virtually no corresponding change in the magnitude of their hours response, #21, 22, 25 and 37. Furthermore, three more industries display a decline in both their employment and hours responses, #25, 33 and 35. In only two industries, #27 and #39, did the employment response increaseand only in the latter was it coupled with a smaller hours response. Two remaining industries exhibit no significant change either way.

Table 4 displays a second measure, the "relative response of hours." This is a ratio of the hours adjustment response in relation to the total labor input response where the latter represents the sum of the hours and the employment impulse responses. This measure reveals an even greater trend toward hours adjustment at the expense of employment adjustment in the post1979 period. For example, even in #23, where the employment response rose somewhat in the post-1979 period, the hours adjustment response was relatively larger. Thus the hours response as a ratio to total labor input response actually increased here as well. In all but two of the 16 total 2-digit SIC industries, the share of hours adjustment in total labor input adjustment clearly increased in size in the period after 1979 across a majority of steps. SIC #39 is clearly an exception and #27 is suspect.

Potential Explanatory Factors: Product Market Competition

We will now observe the extent to which various measures of change in the pre- to post-1979 of impulse responses by industry are associated with either the levels or trend in these potential explanatory variables. Unfortunately, a 2-digit industry cross-section sample does not provide sufficient degrees of freedom to conduct reliable hypothesis testing with multivariate regression analysis. Given the limitations of the data with regard to their frequency and periodicity, we can provide no more than a descriptive, qualitative analysis. For each explanatory variable candidate,

we will observe the change in their values both between and within the two subperiods.

There are at least three suitable indicators available by industry of intensifying market competition, each of which presumably leads firms to more intensely seek greater short-run labor input flexibility and/or reduction in unit labor cost--import and export penetration ratios, industry concentration ratios and variability of output demand.[40] This suggests that those particular industries subject to intensifying global market competition after 1979 ought to exhibit greater numerical and worktime flexibility if such competition implies continually shifting or increasingly uncertain market demand. In addition, if such global competition also involves stiffer price competition, the same particular industries may also exhibit a substitution of hours for employment adjustment if employers choose to pursue this as an avenue to short-run labor cost reduction.

Burtless (1995) reviews the literature analyzing the impact of international trade on the earnings distribution, which is presumed to impact most directly on the wages of the relatively lower-skilled segment of the work force. The evidence is mixed. Although some studies such as Sachs and Shatz (1994) and Lawrence and Slaughter (1993) suggest the impact is only slight, others such as Borjas, Freeman and Katz (1992) find the effect of trade on wages was particularly large between the years 1981 and 1986. This means there may have been extra pressure in our post-1979 period on employers in manufacturing exposed to foreign trade to drive down unit labor costs. Thus, the foreign trade as a share of shipments variable may be an explanatory variable to the extent that wage reduction and hours-for-employment adjustment substitution are complementary as opposed to substitute strategies to attain lower unit labor cost.[41]

Figure 7 summarizes the levels and trends in foreign market competition, from which we can rank the SIC industries accordingly. Among durable goods, there appears to be some evidence that, on balance, exposure to trade has contributed to the recent change composition of labor input adjustment. Notice that all three aggregates indicate a clear shift downward in the net exports (NX) share of industry shipments after the peak year of 1980. If we classify the NX trends among detailed industries into strong, moderate, and no decline in NX, two of the durables industries for which we observe a moderate decline in NX are two that exhibit a shift toward greater proportional adjustment in hours. Moreover, there is no adverse trend in NX for industry #35, which is an industry exhibiting a decline in both hours and employment adjustment. Indeed, this lends support to the NF

and WF hypotheses that flexibility in hours and employment will be pursued most in industries facing global trade pressures. However, a major factor leaning against the causal role of international trade factors is industry #39. This industry runs most counter to the predominatnt pattern, exhibiting greater employment response and reduced hours response since 1979. Yet, this is precisely the industry in which NX appears to have declined most severely.

If firms increasingly seek to more effectively compete on global markets by lowering unit labor costs, they may believe this can be achieved by substituting hours for employment increases in response to a given change in output, all other factors constant. If this is the case, the foreign trade variable may be picking up the influence on labor input decisions of changing external, macroeconomic forces. For example, in the post-1979 era, firms may perceive (not inaccurately) that they can no longer rely on increasing price inflation to generate revenues sufficient to maintain profitability. They now may rely more heavily on curbing labor costs.

Hiring and Training Costs: Various Indicators of Skill Level by Industry

If human capital investment requirements of jobs in an industry are high or rising, employers may tend to seek alternative forms of adjusting to growing demand for output other than hiring. While skill requirements for an industry cannot be observed directly, researchers have used at least four different types of proxies--extent of computerization, occupational breakdown between blue- and white-collar indicators of particular job skill requirements,[42] and workforce education level.[43]

Computerization has both an indirect and direct effect on labor input. The indirect effect, emphasized in this section, is that on balance computerization upskills jobs and thus heightens the demand for more skilled labor. This in turn raises the average cost of hiring and training new workers, which may dampen changes in employment through both stages of the cycle. The direct effect occurs to the extent computers and labor are substitute more than complementary inputs. Greater computerization may allow firms to respond to growing output demand in the short run without raising either employment or hours. Thus, the growth rate of computerization in an industry is expected to be negatively associated with the employment response, but ambiguous with hours.

There is evidence that since 1979, computerization in work processes increased in the 1980s, in the form of business investment spending on computers and peripheral equipment [Oliner and

Sichel (1994), Oliner and Wascher (1995), Krueger (199]. However, Howell (1995) suggests the timing of investment in computer-based equipment does not align well with skill-upgrading. The latter took place primarily between 1980-82 while the former from 1983-92. Nonetheless, evidence Figure 8 displays two-digit industries, which we may rank by observation according to the level of spending on computerization through 1992.[44]

Industry spending on computerization in the aggregate measure display similar patterns. From about 1978 to 1985, computer spending rose. Afterward it leveled off, or even declined slightly, but remained at higher levels than in the pre-1979 era. Four sectors exhibit the highest growth and sustained its higher level in the post period--#32, 33, 37, 26 and 27. Five other industries show a moderate or slight increase--#25, 34, 35, 20. The remaining industries, #30, 39, 21, 22, 23, and 28 experienced either no growth or a decline in computer spending.

Several researchers have used the white-collar/blue-collar distinction, or the non-production/production worker composition to which it is closely associated, as indicators of skill [Berman, Bound and Griliches (1993), Sachs and Schatz (1994), Machin (1994)]. Berman, Bound and Griliches (1993), Sachs and Schatz (1994:64-69), Lawrence and Slaughter (1993: 209-10), Keane and Prasad (1993) have no reservations using percentage nonproduction workers to proxy for an industry's skill level. Indeed, Sachs and Schatz (1993:67-69) demonstate that there is a reasonably good fit between percentage non-production workers in an industry and the three specific indicators of skill requirements of jobs devised by Howell and Wolff (1992). Percentage production workers in an industry is negatively associated with indicators of cognitive skills (substantive complexity and general educational development), positively associated with interactive ("people") skills and unrelated to motor skills. (in 1980). In addition, Capelli (1993:520) finds evidence of significant upskilling within production jobs, which are largely found in manufacturing. Ideally, he argues, an index of job skill requirements should capture both changes in job content (within jobs) and changes in composition (across jobs).[45]

Figure 9 displays the trends by industry in proportion nonproduction workers. First, the trend in nonproduction workers (NP) has been increasing since 1960. But the level of NP is indeed higher in the post period in every industry, with the exception of #20 and 30. And there appears to be a trend break around 1979, just like that observed with trade. The endpoints (roughly equivalent to the

range) in pre- period were 0.25 and 0.28, and in the post period rose to 0.33 or so. The growth rates of NP in the post period appear about the same as they were in the pre- period. Some industries, such as #26, 27 and perhaps 22 and 23 appear to have slowed, but other appear to have quickened, such as #25, 31 and 37. The trends in NP are clearly countercyclical, but not necessarily more so in the post relative to the pre-1979 period.

The most detailed indexes of skill useful for this study appear in Howell and Wolff (1992). Table 5 is from Howell and Wolff (1992:133), listing the top ten and bottom ten industries in their sample with respect to the change observed in their three skill indicators between 1970 and 1985. It also contains the 1985 skill index level, which gives us some clue as to whether the industry represents a high (i.e., above-average) skill industry in the 1980s, in terms of cognitive, interactive and motor skill requirements. Table 5 suggests there was a strong gain in skill demands in SIC #22, and slight to moderate gains in #20, 21, 35 (and 29, which is outside our sample of industries). Because each of these four industries display a signficant decline in the employment response (and three of them an increase in the hours response as well), skill level becomes a prime suspect behind these changes.

A potential complicating factor in observing time-series trends in skills is that for a variety of reasons, skills and thus the costs of hiring and training are not necessarily symmetric over the cycle. For example, skill levels may be procyclical if employers tend to layoff their least skilled workers and hoard their most skilled during downturns.[46] In addition, hiring and recruiting costs may be procyclical because they are higher with a labor market shortage than with a surplus. Conversely, training costs may be countercyclical if during an expansion, employers hire the most easily trainable workers first and only later add on the most difficult to train.[47] However, since we are constructing qualitative measures of skill levels and trends over a broad period of time, these assymetries should not taint the data much.

An alternative interpretation of the effect of percentage nonproduction (NP) workers is that such workers are treated by firms as fixed or "overhead labor." The fixity of NP may be compensated for by greater adjustment of production workers when output demand fluctuates [Costrell (1989:281)]. This makes the relative fixity of NP workers inversely related to the degree of

adjustment in production worker employment in our data set. This means another potential reason the production worker employment response declines in the post-1979 period may be that employers reduced the degree of fixity inherent in *non*production jobs. Thus, while a rise in the percentage NP might connote a general shift toward greater skill requirements for jobs in an industry and in turn restrain the production worker employment response to a given output shock, this response may be negated if indeed the degree of fixity of NP employment has been reduced by employers since 1979.

Finally, educational attainment levels by industry have been used as a proxy for the skill level of jobs in the industry. Van Ark and Pilat (1994:28-30) use highest level of general and vocational education achieved in manufacturing industries to construct an average labor quality index for the US. Table [ ] displays these data by six industry groups for 1987. The industries that require greater than the average levels of education for all manufacturing are chemicals and machinery. Primary and fabricated metals and miscellaneous manufacturing are about at the average. Those below average are food, tobacco, textiles apparel and leather. In the latter industries, only 15 to 23 percent of employees attained education beyond high school. Thus...

Notwithstanding the various real problems with the proxy measures, descriptive analysis suggests a rising skill level among an industry's work force and its attendant fixed labor costs may play some role in explaining the breakdown in the hours-employment relationship. But it is not convincing enough to rule out other forces that also may be responsible.

Nonwage Labor Costs: Employee Benefit Expenses

Employee benefits create a cost incentive for employers to substitute hours for employment in the composition of labor input demand.[48] The increased intensity of hours in the dynamic adjustment of labor input might be in part the result of an escalation of the cost of nonwage employee benefits. The importance of nonwage labor costs (NWLC's) in labor input adjustment decisions of employers may rise because of three separate factors. One is an increase in the absolute size of such NWLC's. A second is a decline in wage (variable) costs. A third is a changing structure of NWLC's that renders them more of a fixed as opposed to variable labor cost. However, two offsetting factors may make the importance of NWLCs diminish. One is a shrinking proportion of employees eligible for benefits that entail such a fixed cost, and a second is the rising degree to

which employees share in the contributions toward the benefit fund. In brief, employers in manufacturing industries may face an increased incentive to substitute hours for employment during expansions if the cost of various employee benefits rises while hourly wage rates remain stagnant (and the annual base for payroll taxes remains fixed). However, the impact of rising NWLC's on employers may be limited if employers shift the cost either by reducing coverage rates or having employees pay a greater share of the expense. The data in Table 6 suggests the cost of employee health, pension and other nonwage benefits has indeed grown since 1979. However, aggregate data in Table 6 also intimate the rate of escalation in costs such as health care for employers has declined. Its likely effect has been mitigated by employers shifting such costs on to employees.

National income and product account (NIPA) data from the Bureau of Economic Analysis (BEA) at the US Department of Commerce regarding total supplements to compensation--employer contributions to social insurance funds plus other labor income (private health and retirement insurance funds), in the three industry aggregates. In manufacturing, total supplements as a percentage ofwages and salaries rose from 10.8 in 1960 to 22.9 in 1980 and to 24.6 in 1992. The BEA data by industry, which span from 1968 to 1994, illustrate that the sharpest increase in nonwage income supplements actually occurred between 1968 and 1978. Average annual growth in nonwage income supplements clearly decelerated in the post period. The average rates of growth in the ratio of nonwage income to employment over the post (1979-94) period was only about half the rate observed in the pre (1968-78) period for the total manufacturing (TM), durable manufacturing (DM), and non durable (NDM)manufacturing:

	Pre	Post
TM	0.107	0.059
DM	0.107	0.060
NDM	0.106	0.057

Table 7 displays the BEA data on the relative importance of nonwage benefits as a percentage of employment, by 2-digit industry detail. Four industries clearly have extraordinarily high levels of such nonwage costs--SIC #21, 26, 33 and 37. In addition, industries exhibiting higher than average rates of growth in the post period are #21, 22, 23, 25, 27, 28, 34, 35, 37. This means that two, but only two, industries are the likely candidates whose fixed employment costs will play a large role in

influencing the nature of their labor input adjustment pattern. These are SIC's 21 and 37. Indeed, these are two of the industries which experience a significantly declining response of employment in the post period. However, neither industry experiences a significant gain in hours adjustment in the post period. And in industries #26 and 33, there is also a declining employment response but no change in hours response (with the exception of period 12 for the former). Moreover, industries #22, 25, 28 and 34 are industries that experienced both a decline in employment response and an increase in hours response in the post period. Thus, industries where nonwage benefits are both high and growing appear also to be industries where the employment response to a change in output has declined in magnitude. In contrast, nonwage benefit expenses appear unconnected to the hours responses.

The BEA data on nonwage benefits reveal that virtually all 2-digit industries experienced a deceleration in the rate of growth of nonwage benefits. However, there is some diversity with regard to the extent of decline. The industries in which NWLC expenses subsided by more than the average decline for all manufacturing industries were SIC #29, 21, 33, 26, 34, 36, 20 and 32. NWLC thus is most likely to remain important in post period labor input determination, in order, are in SIC industries #38, 31, 28, 37, 39, 30, 27, 25, 35.

BEA data on insurance costs, which span from 1977 to 1994, are presented in Table 8 below. These ratios of insurance costs to employment for TM, DM, and NDM from 1977 through 1994 are in dollars per worker. While these are clearly not sufficient data for a pre- to post-1979 comparisonor detect a structural break in the long-term time-series, they do show us two patterns. One is that since 1979 insurance expenses per worker in nominal values rose from less than $1000 per worker in manufacturing (about $1000 per worker in durables and $600 in nondurables) to about $3800 per worker (over $4000 in durables and over $3000 in nondurables). In constant dollars, insurance per worker rose from $1500 per worker to $2500. The Table and Figure 9 also shows that while insurance expenses rose in the years 1979-83, they rose most steeply in the years 1987-93. Thus, while the trend in the post period is not steady, the mean level is clearly higher than it was in 1979 or 1977.

Estimates of health care expenses and coverage, pension contributions and coverage rate trends are presented in Table 9. Data presented by Houseman (1995:113-14) and Woodbury and

Bettinger (1991), incorporated into Table 9, illustrate the trend in health insurance coverage rates. The data show that after 1979, the percentage of manufacturing workers and high school-educated workers included in a health or pension plan dropped.[49] A number of employers appear to have reduced their payments into, or dropped altogether, health and/or pension plans. Thus, a considerable share of the rising expense of insurance is being shifted rather than fully absorbed by manufacturing employers.

The US Chamber of Commerce's, *Employee Benefits* annual survey, legal and other mandatory payroll contribtutions, paid time off, employee benefit plans provide the most detailed picture of trends in NWLC. Table 10 displays estimates of the cost of such benefits as a percentage of payroll in 1959, 1978 and 1992 for aggregate manufacturing. These endpoints for the pre and post periods show that while employee benefit expenses are now higher, the growth rate was much more steep in the period prior to 1980 (see columns two and three). (This is reinforced by BLS data on supplements to compensation for selected years, also presented in the table.) Even using average annual growth rates for each subperiod would reveal a higher rate of growth of benefit expenses in the pre-1979 period. The average annual growth rate in the pre1979 period for all manufacturing was 0.46 while for the post period it is 0.27.

Table 11 also displays the trend in 14 detailed industry groupings in manufacturing used by the Chamber of Commerce. There is variation between industries in growth rates of their benefit expenses in each superiod. There is also variation between industries in the relative importance of type of benefits paid. These data suggest that the industries facing extraordinarily high benefit expenses are SIC #30/31, 34, 37 and 20/21. Of these, it is #30/31, 20/21 and 34 that also experienced a higher than average rate of growth in benefit costs--which are three of the five total industry groupings that exhibited a higher than average growth rate in benefit costs as a percentage of total payroll. Thus, these are the industries whose dynamic hours-employment response will likely be influenced most by NWLC's. The EB hypothesis is supported to the extent that these are the industries in which relative hours adjustment response gained the most. A glance at the rankings of the standardized differences rankings by industry reveals that industries #30 and 37 tend to have experienced relatively large gains in their employment response in the post period. However, SIC's #20, 21 and 34 are in the middle of the pack. In their standardized hours responses, the above

industries tend to appear in the top half but not at the very top of the list. Thus, the data provide some but not convincing evidence to support the EB hypothesis that hours adjustment has replaced employment adjustment because of the rising expense of benefits as a percentage of employer payroll.

NWLC data thus provide some weak evidence regarding the strength of its role in encouraging the shift toward more intensive utilization of hours. We speculate that perhaps prior to 1979, firms were more able to pass along these prices to consumers via higher prices. The change in the macroeconomic policy environment since then and heightened foreign competition (see next section), has perhaps prevented such cost-shifting.

Labor Market and Labor Force Characteristics

It is possible that labor market conditions faced by an industry may influence the character of an industry's adjustment of labor input to a given shock in output.[50] This includes union density and composition of the work force, such as the share of jobs that involve part-time, flexitime or irregular shift schedules. Collective bargaining agreements may reduce the flexibility employers retain to increase hours at the expense of employment. Of course, this depends on the preferences of union members, the strength of such preferences vis-a-vis employer preferences regarding worktime and employment and their bargaining power to obtain such preferences.

A cursory look at union density data from Freeman and Medoff (1979) and Kokkelenberg and Sockell (1985) for the pre-period and Curme, Hirsch and MacPherson (1990) for post-1979 data reveals some trends. Table 12 shows that in the earler period, unionization declined in total manufacturing, although the estimates are not strictly comparable. The industries experiencing the greater than average deunionization in the 1960s to early 1970s were #20, 21, 23, 25, 27, 34, 35, 38, 39 and especially #29, 30 and 36. The four industries experiencing the largest declines in union density during the 1970s are #23, 37, 27 and 35. Thus, for the pre- period, several industries were already deunionizing--especially #23, 27, 35 as well as 30. The proportional adjustment of hours grew in these industries, suggesting that deunionization in the pre- period may have facilitated more intensive adjustment of hours relative to employment in the post- period. However, the last four SIC's did not exhibit an exceptionally high growth in the relative hours response.

[inconclusive until we observe 1983-91 unionization data print-out]

Part-time and other nontraditional work schedules are a potential substitute for employment or weekly hours flexibility for full-time workers. If indeed such jobs or schedules are an alternative path to the similar end of numerical and worktime flexibility, their share of jobs in an industry ought to be inversely related with the employment and hours response.

Tables 13 and 14 help illustrate the levels and trends observed in these variables in the two subperiods. Proportion on part-time schedules, by 2-digit industry, 1968, 1979, 1992. The proportion on flexitime or shift-work schedules, 1985 versus 1991show ...

Identifying Leading Candidates that Altered the Employment and Hours Response

Table 15 groups the information gleaned from the discussion so far. We can now observe whether industries that have exhibited since 1979 a significant substitution of hours for employment adjustment are indeed those subject to shifts in labor or product market characteristics. And we can then pinpoint which particular factors appear to be important and which inconsequential for labor input adjustment patterns.

Conclusions and Implications for Analysis of Working Time and for Policy

This paper investigates the adjustment of labor input in response to a variation in output. In sum, our key finding with VAR analysis is that in recent years is the proportional response of employment to changes in output has decreased relative to the response of hours. Moreover, the change in the relative response of employment has occurred because of a decline in the employment elasticities with little change in the hours elasticity. The standardized employment and hours responses cast substantial doubt on the hypothesis that employers are responding to heightened competition through greater numerical flexibility. Despite stiffening international competition across virtually every industry, not one single industry exhibits both greater employment and worktime flexibility. Several industries, however, have reduced employment responses in combination with greater or at least similar responses in worktime vis-a-vis the earlier period. Thus,we conclude that stiffer cost competition has heightened attention to various fixed costs of employment, which has led most industries in the post-1979 period to reduce the degree of hiring

following a spurt in output demand. Our findings corroborate those of Hamermesh (1993) but contrast with those of Abraham and Houseman's (1993). The potential underlying causes of this development are drawn from three different strands of labor market research. The leading suspects can be identified conclusively only with future empirical research that rigorously tests the various possible causes. The apparent strength of the role played by each variable will suggest the appropriate policy to facilitate job creation instead of longer work hours.

NOTES

1. E.g., Hart (1987), Ehrenberg and Schumann (1982).

2. E.g., Rosen (1969), Raisian (1983), Hamermesh (1995).

3. Hamermesh (1995) creates a useful taxonomy distinguishing net from gross employment costs.

4. The output variable has been measured by several alternative means. These include the real value of gross domestic product [e.g., Gordon (1993), Quandt and Rosen (1989)], physical output such as the industrial production index [e.g., Bernanke and Powell (1986)], new orders for durable goods [e.g., Rossana (1985), Kraft (1989)] and shipments [e.g., Abraham and Houseman (1993a)].

5. See for example Rossana (1985).

6. See for example Kraft (1989).

7. Abraham and Houseman (1993b). They also point out that theoretically, a short-term movement in demand may lead to a more full adjustment in labor input when the changes are long-lasting (persistent), or, to relatively smaller adjustment in labor input if the cost of shedding labor through attrition is less costly than layoffs.

8. For example, Smyth (1984) uses 2-digit level manufacturing sector data and Smyth and Karlson (1991) use disaggregated, quarterly data on the auto industry, 1967 to 1985. Chang (1983) uses quarterly data from 1962 to 1979 on hours paid for auto industry in the U.S. and in Michigan. Rones (1981) observed the lag in timing between hours reduction and layoff rates during post-War downturns, and found them to vary by detailed industry-type and by recessionary period.

Smyth and Karlson (1991) find that the length of time (speed) to adjust employment to its optimal level E^* fell from 6 to 3.5 months in the mid-1980s, which they attribute to rising fringe benefit costs. Adjustment costs themselves are procyclical [Burgess and Dolado (1989)]. Smyth and Karlson (1991) find higher unemployment yields slower speed of employment adjustment, which results in a larger employment fluctuation for a given output variation, longer lags in employment change during recessions and shorter lags during recovery, which both imply smaller average changes in hours.

9. Cho and Cooley (1994) find that three-quarters of the adjustment in total hours in the US, 1955 to 1984, is traced to employment and only one-quarter to hours adjustment. Hunt (1994) analyzed 1977-92 manufacturing data for 201 detailed industries as a panel to investigate the impact of 1985 legislation in Germany facilitating easier discharging of employees She found some weak evidence that blue collar employment adjustment became less flexible following the legislation (while white collar employment flexibility fluctuated). Blue-collar worker hours adjustments were more flexible in 1982-88 than in 1977-81, but less flexible in the 1989-92 period. She concludes that the timing and direction of changes suggest the source of observed changes are not the result of the 1985 legislation that altered firing costs. Nakamura (1993) found in Japan, employment fluctuations are proportionally smaller than in the U.S., while overtime hours bear the burden of adjustment to output change, indeed overshooting to compensate for the relative absence of employment adjustment.

Regarding intercountry comparisons, Abraham and Houseman (1993a) find, for eleven

industries, 1974 to 1984, the US adjusts primarily through employment change in the short-run (only in the medium-term adjustment in Germany). Importantly for the present study, no change at all was found in the pattern of adjustment of hours or employment when comparing 1962-72 to 1974-84. The US has an almost equally large response of total hours, because the weekly hours response is smaller. Hashimoto (1993) also found hours to be less variable and employment more sensitive in the U.S. relative to Japan.

Van Audenrode (1994) also finds that, relative to other countries, the US has higher speed of adjustment in employment and slower in total hours. He uses an error-correction mechanism and quarterly data from 1969 to 1988 to compare "elasticities of adjustment" of actual toward "desired" N and NH levels. A simulated one period drop of 10% in the equilibrium NH traces the adjustment path of N and H toward the new eqb. Using estimated coefficients, US exhibits steepest adjustment decline in N (a drop of 8% after 4 quarters, 10% after 8) among several OECD countries, with only a small decline in H (2% in the first quarter but 0% by quarter 8). Hansen's (1985) variance decomposition of NH for the US data only also finds that most (77 percent) of the variation is attributable to fluctuation in employment.

Hamermesh (1993) finds the degree of employment response to a simulated shock in output in eight of nine major industries, including durable and nondurable manufacturing, declined progressively to and output shock introduced in the years 1973, 1981 and 1988. In contrast, Abraham and Houseman (1993b) find little evidence that either the degree or speed of adjustment in both hours and employment for production workers or production hours in the US declined. The lagged adjustment responses with respect to output were not signficantly different in magnitude during the 1978-1985 period than they were in the 1970-1977 period in the US.

10. E.g., see Atkinson (1987), Boyer (1988), Pollert (1989), Rosenberg (1991), Hunter, McGregor, MacInnes and Sproull (1993).

11. The flexible specialization hypothesis makes the growth of skills and numerical flexibility intertwined. Capelli (1993:517) argues that employers are increasingly seeking market niches and quicker reactions to changing markets. To achieve this, employers are constructing are more flexible workplace, part of which involves upskilling of jobs and occupations in manufacturing.

12. The former would include. e.g., unemployment insurance (UI) contributions for all employees who earn over the annual earnings ceiling and the latter UI contributions for those employees earning below the ceiling.

Thus, work hours will follow a path over time in industry "*i*" in time period *t*:

Holding employment constant, and placing sector-specific influences in the error term (e), actual hours will be influenced by the rate of output (Q) and the degree to which jobs are accommodating work force preferences (H*). β measures the degree of worktime flexibility. Perhaps facilitated by changes in technology or work organization a firm may achieve total or partial ("adaptive") respectively, if:

Alternatively, "inflexible hours"occurs when both coefficients β and γ are zero.

13. Literature analyzing the secular trend in average hours includes Kniesner (1976), Coleman and Pencavel (1993), Schor (1991), Owen (1989), Northrup and Greis (1989). Studies of structural and cyclical trends include Whitely and Wilson (1988), Holm and Kiander (1993), Bernanke and Powell (1986), Hashimoto (1993). Ehrenberg and Schumann (1982) find no evidence of a rising deterministic trend in overtime hours, up through 1977. In contrast, we do find evidence of a "phase shift" after 1979.

14. E.g., Layton and Moore (1989), Popkin (1990), Klein (1990) Koch and Rasche (1988). DeLeeuw (1991) suggests the predictability in the sequence, timing and magnitude of hours adjustments presumed by Figure (1) may be confounded.. If a rise in orders for output is known or correctly anticipated, firms can skip the stage of adjusting hours and instead build their employment staff in advance of plans to boost production If changes in output are induced by supply-side, productivity gains, it implies different lead-lag relationships. Finally, once firms eventually begin hiring additional employees to achieve a desired higher level of production they may start to *reduce* overtime hours. Thus, predictability hinges on whether output changes are expected, are supply- or demand-induced, and whether overtime hours are used first as a substitute for employment and later as a complement.

15. E.g., Gordon (1993), Perry and Schultze (1993), Fair (1985)..

16. The short-run reasons employers use overtime hours are to fill rush orders, meet seasonal peaks in demand, cover employee absences or vacancies due to unmet skill requirements or to delay hiring when future demand has become more uncertain [Carr (1986)].

17. For analysis of UK hours, see Whitely and Wilson (1988). They argue that the trend in hours has both a “normal” and a “cyclical” component, where the latter is due to fluctuations in output demand. They find a long-term decline in both the average and "normal" workweek, and they interpret this as a labor supply-side response to real income growth. They also claim average hours closely follows the path of normal hours with a lag and a strong cyclical pattern around its secular trend, changes in the trend are discontinuous while changes in the average are smooth, shifts in hours are common and synchronized across industries, and a "paradoxical situation" has developed where overtime hours remain high in many industries despite a long-term decline in hours and higher unemployment. Hart and Ruffell (1993) found that in 1981, 1984 and 1989 cross-sections in the U.K., use of overtime hours rose despite a rise in unemployment and a decrease in the standard workweek. Holm and Kiander (1993) find empirically that Finnish employers use overtime hours exclusively as an adjustment to short-run fluctuations, while employment changes serve as a longer-run adjustment. Finally, in Kraft (1989) current output change strongly affects overtime hours, consistently larger in magnitude than its effect on employment. On the other hand, expected future output has no effect on overtime hours but positively affects employment in 12 of 15 industries examined.

18. Keane and Prasad (1993) find using panel data that hours in both durable and nondurable manufacturing are acyclical, but are *procyclical* for “higher quality” (college educated) workers.

19. Because we are using data within a single country and a single major industry, we are largely abstracting from differing institutions due to labor law or policy. In the US, where employment-at-will dominates (although mitigated by the threat of wrongful discharge litigation), we are also removed from the more stingent, European-style restraints on firing and layoffs. Thus, we are also abstracting from the possibility that such laws result in restricted hiring and thus lower

turnover and fewer employment opportunities for the unemployed [e.g., Hogan and Ragan (1995) and Barron and Loewenstein (1994)].

20. Average weekly hours themselves have at least three dimensions: (1) mean duration, (2) variability, (3) dynamic flexibility. The mean length of hours is altered by three distinct mechanisms of hour adjustment: standard hours per week (SH); hours of part-time workers (PTH); and overtime hours (OTH). The contribution of each in determining average weekly hours (AWH) is represented by equation (1). Each component is weighted by the proportion of the work force working exactly the standard workweek, part-time hours or overtime hours,

In manufacturing, short-run responses to output occur mainly through the lengthening or shortening of an available stock of overtime hours.

21. Since we use levels, the parameters that explain the system's dynamics are estimated consistently. Therefore it is not necessary to test for unit roots or cointegration [Hamilton (1994:652), Sims, Stock and Watson (1990)].

22. This is the same sequential ordering as in Bernanke and Powell (1986). The lag length of 13 months is selected using likelihood ratio tests. This should be sufficient to absorb the potential effect of serial correlation inherent in the data.

This sequence of adjustment is rooted in fixed costs of employment adjustment models. These assume optimal employment changes are "lumpy" and lagged (i.e., labor hoarding occurs) [Fair (1985), Hamermesh (1992)]. This system is recursive because the output elasticity with respect to hours and employment determines the extent of change in output supplied that results.

Fair (1985), presumes the decision-making follows the sequence (L^d) to prices (P) to capital investment (I) to wage rates (W), and that the process is initiated by an exogenous change in output (Q).

In contrast, we focus in this paper on the composition of labor demand. In the sequential order we impose for our recursive system, we assume output is not influenced by contemporaneous changes in the other three variables. (See Lutkepohl (1993: 48-55) or Hamilton (1994: 318-23 for further discussion of interpreting an impulse response function when there is contemporaneous correlation between the residuals in the VAR system.) However, innovations in a current month's output is assumed to affect this month's average hours of work.

23. See procedures described in Doan (1992: 10.1) using 500 random normal drawings.

24. The sources of all data used in these analyses are: the US Bureau of Labor Statistics Survey of Establishments for the average weekly hours, average weekly overtime hours, production worker employment and average weekly earnings series (kindly provided in the BLS's LABSTAT diskette); and, the Federal Reserve Board's Industrial Production Index (IPI) to measure industry output.

25. Lutkepohl's F-test statistic concludes that parameter estimates for the three aggregate sectors from the 1954-1978 period yield poor, high-error forecasts of the actual variation observed in the subsequent 1979 to 1982 period, supporting the notion of a structural break in the system in 1979.

26. We attempted to check for the possibility that the observed weakening employment response is an artifact of an assymetry--that there are more months of business cycle expansion than contraction in the data series. The VAR was reestimated with periods of recession excluded. The results were similar to earlier results. Thus, the changes observed between the pre- and post-1979 periods is not attributable to either the number or length of recessions or expansions in the two subperiods.

For descriptive evidence that employers are increasingly coupling layoffs with longer average work hours for the survivors see Bewely and Brainard (1994).

27. Note that the declining response of employment may also be the result of either greater firm uncertainty regarding wages and product market conditions or hiring and firing costs. When these grow, the size of the firm's "no response" region (or band) in their optimal employment response policy may increase [Bean (1994: 610)]. However, variations in wage uncertainty and firing costs are likely to be small among detailed industries facing similar circumstances and institutions within a single country.

28. Casting skepticism regarding the role of EB is the wealth of descriptive evidence suggest that employers have shifted the burden of much of the rising fixed employment costs during the 1980s. For example, contributions toward pension coverage have been reduced or shifted toward less-costly defined contribution rather than defined benefit plans, and many such plans have become underfunded [Orr (1996), Woodbury (1991)]. Moreover, health care coverage of employees has declined and more of the premiums shifted toward employees, and paid vacation days, sick-leave and holidays have ceased growing or diminished [Rosenberg (1991)].

29. Although it is possible that the hypothesized importance of human resource strategy is masked by the fact that manufacturing employers are hiring more contingent, e.g., temporary help supply, workers to gain such numerical flexibility. Indeed, manufacturing employers have increased such hires substantially in recent years [Segal and Sullivan (1995)].

30. The gain employers have realized in working time flexibility has been mainly in the form of multiple or continuous work shifts [Rosenberg (1991), Mellor (1986), BLS (1991), Horrell and Rubery (1991). This does not necessarily vary the average hours worked per employee.

31. Montgomery's (1992) study of the determinants of layoffs us in establishment level data, average weekly hours is an independent variable. This tests the hypothesis that employment and hours are net substitutes. The relationship is negative but insignificant, leading to the conclusion that the two are weak substitutes at best and perhaps both are determined endogenously.

32. The decline in impulse response paths since the earlier period is generally a bit sharper when using the average workweek than it is for overtime hours, but the patterns are similar. The correlation between log differences inthe average weekly hours and overtime hours series is high, 0.80 for total manufacturing, 0.82 for durables and 0.71 for nondurables. This correlation grew in the 1979-1993 period to 0.86 for durables but declined to 0.69 for nondurables.

33. Placing Q at different points in the recursive chain created no discernable change in the correlations in the residuals from the VAR estimation. Nor did the reordering affect the size and timing of the peak impulse response for the three aggregate sectors and the 2-digit industry estimations. The only observable difference is actually slightly higher estimated impulse responses in the nondurables aggregate.

34. B. Moore (1995) suggests such a substitution may be reinforced by a declining relative factor price of capital.

35. One potential reason for the declining sensitivity of manufacturing employment to output fluctuation may be the growth of temporary workers hired in the manufacturing sector. Segal and Sullivan (1995) find that the proportion of workers employed in the personnel supply industry (SIC #736) that are in blue-collar occupations, many of whom are likely to be placed in manufacturing SIC jobs, rose between 1983 and 1993 from 9 to 23 percent (from an estimated 56, 000 to 443,000). If manufacturing sector employers increased hiring of such contingent workers to buffer their "core" employees in the post- period, this may reduce the cyclical sensitivity of non-contingent employment. However, to observe the effect of greater contingent workers on the manufacturing sector's employment sensitivity to monthly fluctuation in output we would need direct observations of such workers by SIC industry at frequencies higher than annual.

36. Hoffman (1993) finds the top five reasons European businesses may not add employees, ranked in order, are: level of product demand; insufficient profit due to competition; high nonwage labor costs; lack of sufficient flexibility in hiring or shedding employees; new technologies and work reorganization.

37. Howell (1995), Berman, Bound and Griliches (1994), Hart (1987), Doeringer and Piore (1971).

38. See for example Medoff (1979), Montgomery (1992).

39. See King (1978), Horrell and Rubery (1991), Mellor (1986).

40. Import penetration ratios are utilized by

41. Brauer and Hickock (1995) and Vroman and Vroman (1991) examine a host of indicators of foreign trade exposure, and find that import penetration, used also by Addison, Fox and Ruhm (1995), is perhaps the most reliable indicator.

42. Other indirect measures of technological advance in an industry for which there exist time series data might include the rate of growth in research and development spending and the rate of capital intensity. However, the former is probably too removed from the issue of production worker hours and employment to be useful in this particular study. The latter was found by Howell (1989) to be a relatively poor proxy for job skill requirements (although it is a key determinant of wages in heavy manufacturing industries). The influence of capital quality on worker skills demanded and ultimately on job creation may be better captured measures such as the contribution of capital services to gains in the multi-factor productivity index.

43. Studies using median education level as indicator of skill include Bartel and Lichtenberg (1987), van Ark and Pilat (1993), Howell and Wolff (1992), Howell (1989) and Chinloy (1980).

44. Lumber, Paper and Chemical Products are three industries in which the hours to employment connection weakened considerably in the post-1979 era. Figure 9 tracks the time-series path of the proportion of industry employment that is nonproduction workers #24, #26 and #28. Note the diversity present in Figure 9 industries #24 and #28 experienced a growth in nonproduction workers, the former in the early 1980s and the latter in the early 1990s. Industry #26, however, experiences only a negligible increase in nonproduction worker employment.

The percentage of manufacturing industries' work force classified as nonproduction employees generally continues to grow, despite Caves and Kreps (1993) analysis finding many firms have been pushed by intensified competition or mergers to shed layers of white-collar positions in manufacturing (albeit less so in service-producing industries (Roach (1991)). Howell (1995) maintains the impact of computerization upskills some jobs but deskills others, and its effect on jobs occurred primarily in the early 1980s rather than through the entire 1980s and 1990s.

45. Capelli's index of skill is based on job analysis and skill change assessment conducted by a major human resource consulting firm, based on criteria such as know-how, problem-solving and accountability.

46. This procyclical skill level is found by Keane and Prasad (1993).

47. This reflects the cyclical nature of hiring and firing practices within internal labor markets, first described by Doeringer and Piore (1971).

48. Hamermesh (1983). In addition, there are some interactions between the nonwage compensation and human capital investment costs. For example, the more firms moderate their use of layoffs and instead hoard labor, the lower their required UI fund contribution rate will be, thus lowering their long run fixed employment costs.

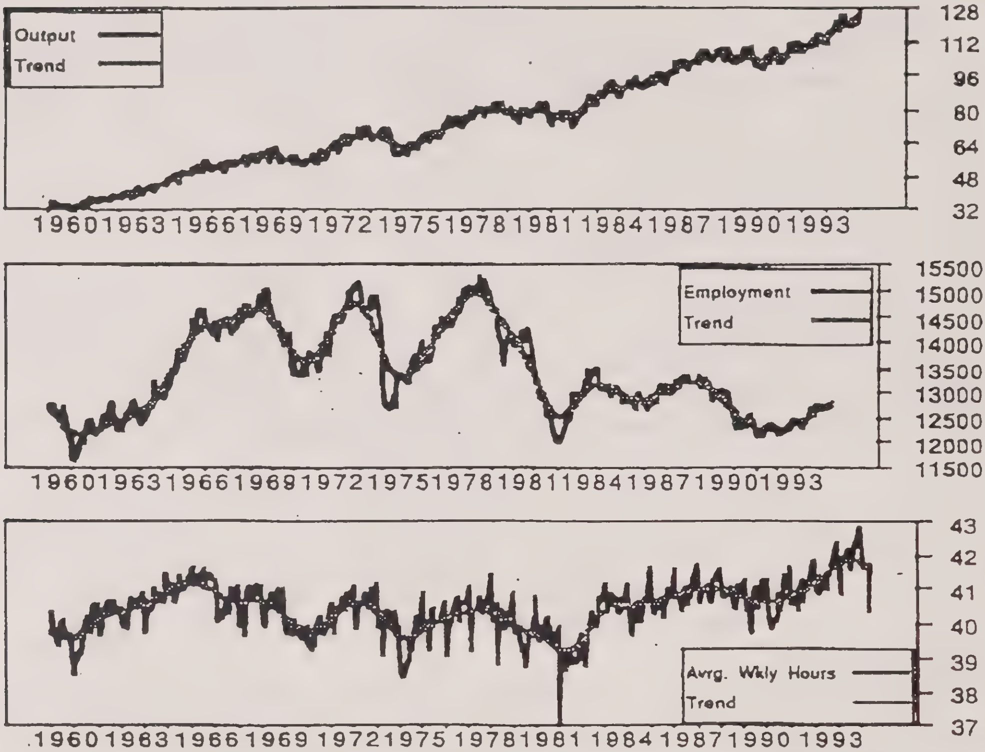
49. BEA estimates that:

1992, Health Care Expenditures in billions of dollars:

	Total expenditure	$Employer expenditure	Percent of total	$Employee expenditure	Percent of total
Manufacturing workers.......	$63.4	$56.3	89%	7.1	11%

50. This includes adjustments in pace of work, which ought to register in industry productivity indexes. This is a variable that ought to be added in future research to the VAR system, to absorb any discrepancy between change in output and consequent change in quantity of labor input measures.

Fig. 2 Industrial Production (Output), Employment of Production Workers, And Average Weekly Hours for Manufacturing, 1960 through 1995



Since 1979, for manufacturing overall, there has been a downward trend in the employment of production workers even though industrial production increased. Moreover, there has been an upward trend in average weekly hours during this period.

Whereas since 1979 the correlation between hours and employment has been negative, prior to 1979 it had been positive.

Figure 3

Dark: Pre Period

Light: Post Period

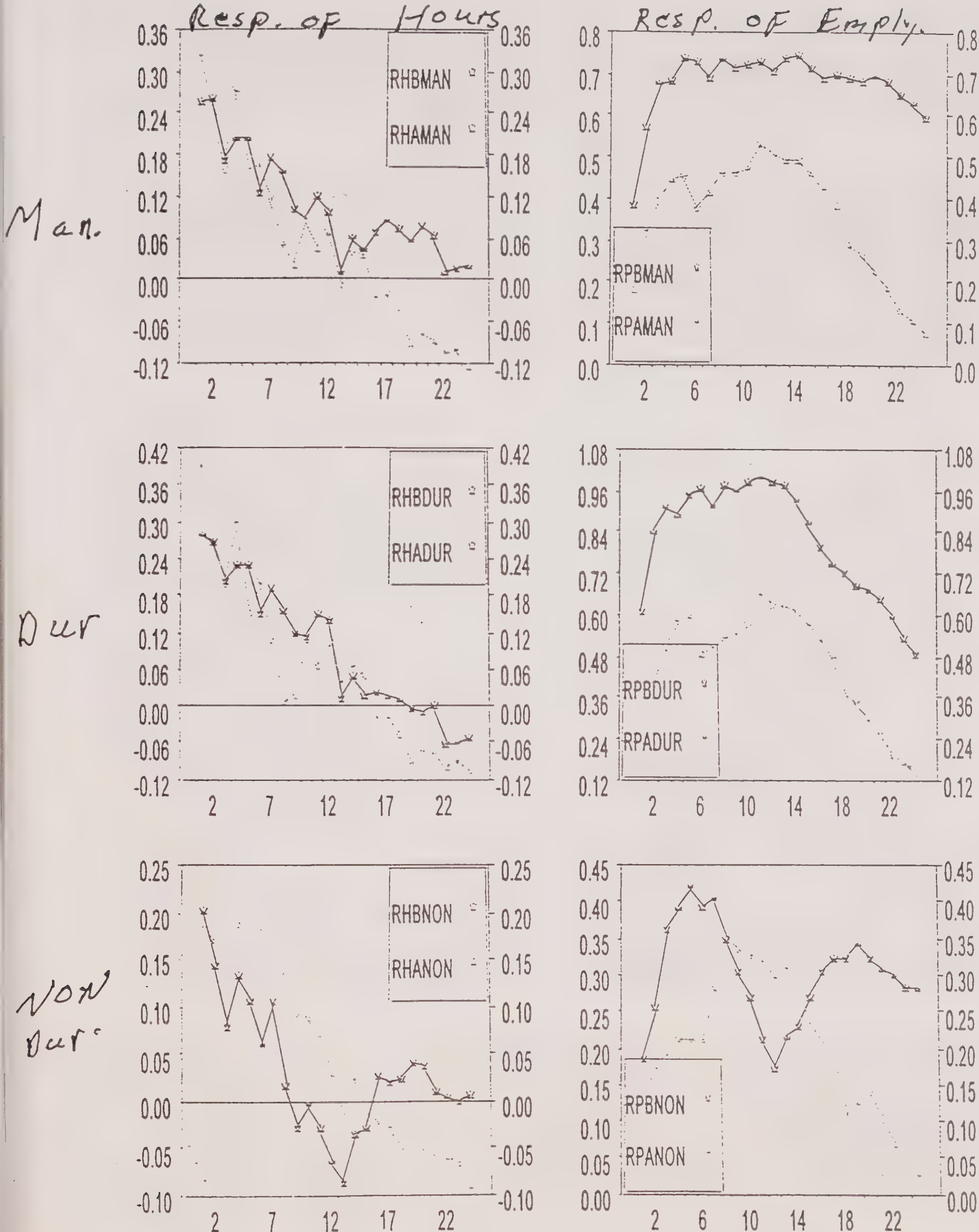
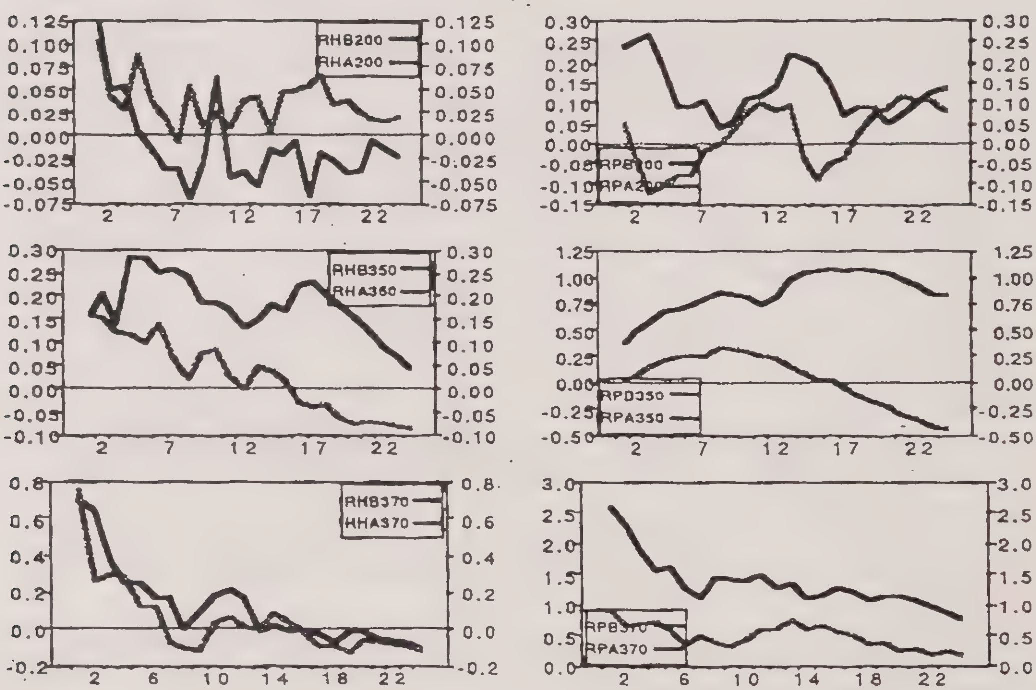


Fig. 4 Impulse Responses for the Two–Digit SIC Industries with the Largest Shares of Employment in Both the Pre and Post Periods.

These industries are Food (SIC 200), Machinery (SIC 350), and Transportation Equipment (SIC 370). The left column contains the impulse response graphs of hours to a shock in output and the right column contains the impulse response graphs of employment to a shock in output. For all graphs, the black line shows the impulse response in the pre–period (1960-1978) and the gray line shows the impulse response for the post–period (1979–1995).

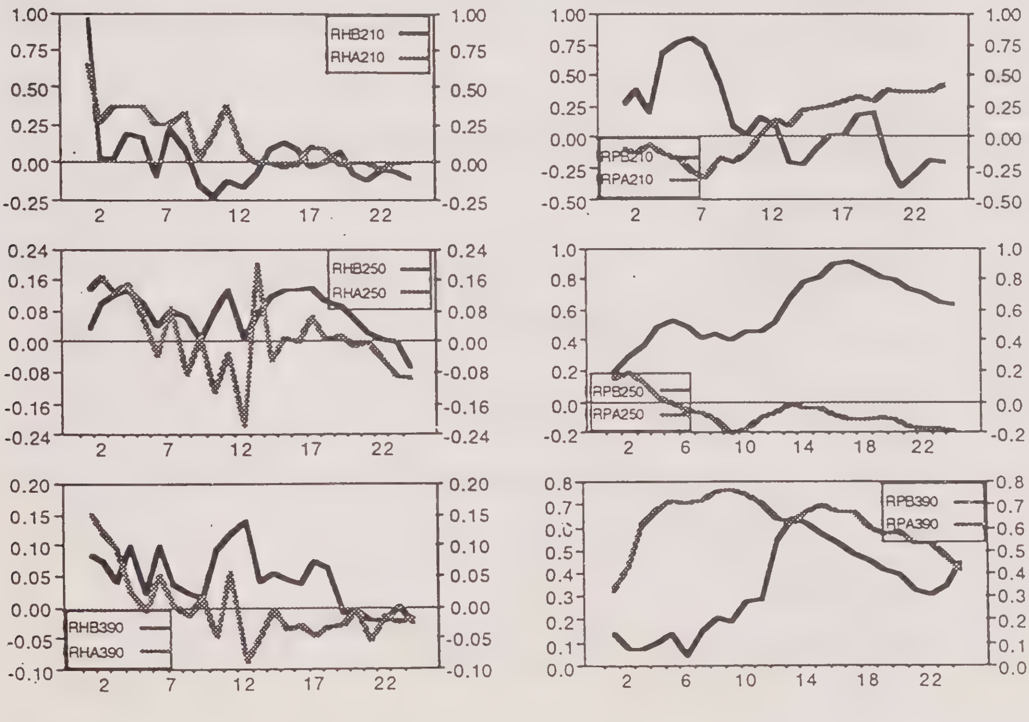


Industry	Share of Manufacturing Employment in 1977	Share of Manufacturing Employment in 1987
Food (SIC 200)	8.9%	8.8%
Machinery (SIC 350)	9.0%	10.0%
Transportation Equipment (SIC 370)	9.3%	9.2%

Figure 5

Impulse responses for the Two–Digit SIC Industries with the Smallest Shares of Employment in Both the Pre and Post Periods.

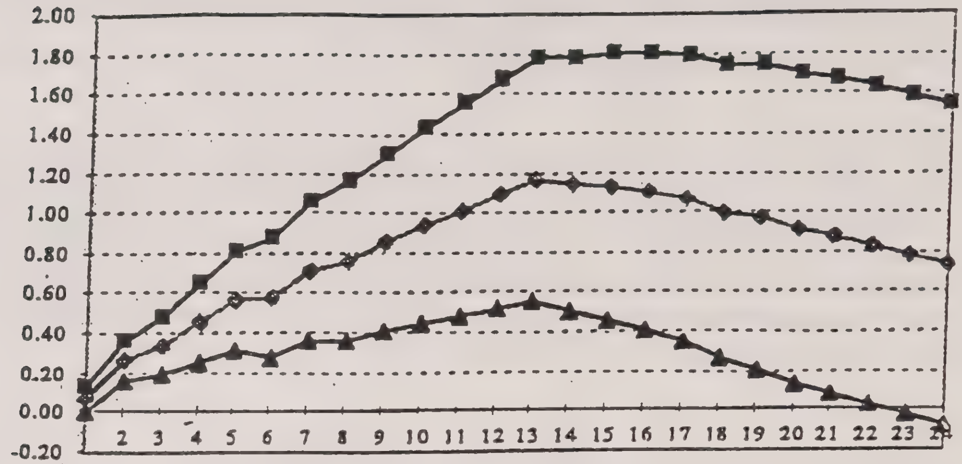
These industries are Tobacco (SIC 210), Furniture (SIC 250), and Misc. Manufacturing (SIC 390). The left column contains the impulse response graphs of hours to a shock in output and the right column contains the impulse response graphs of employment to a shock in output. For all graphs, the black line shows the impulse response in the pre–period (1960-1978) and the gray line shows the impulse response for the post–period (1979–1995).



Industry	Share of Manufacturing Employment in 1977	Share of Manufacturing Employment in 1987
Tobacco (SIC 210)	0.6%	0.3%
Furniture (SIC 250)	2.5%	2.9%
Misc. Manufacturing (SIC 390)	2.4%	2.1%

Figure 6 A

Sic 350 Response of employment to hours Pre-period.



Sic 350 Response of employment to hours Post-period.

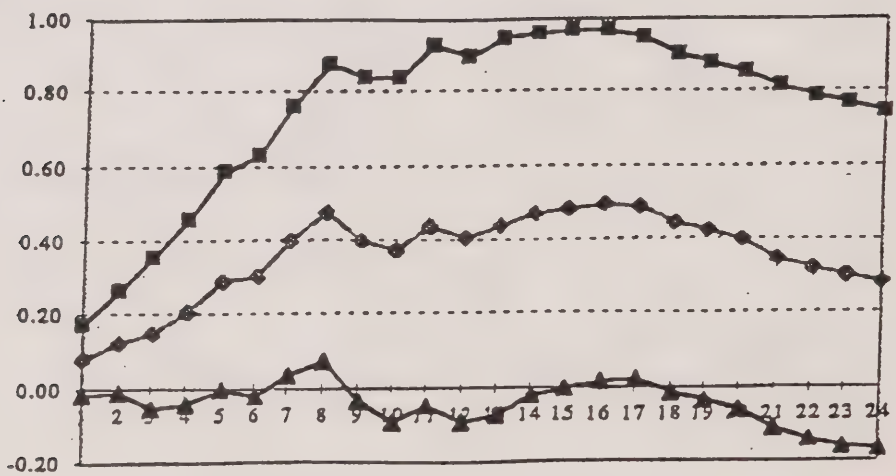
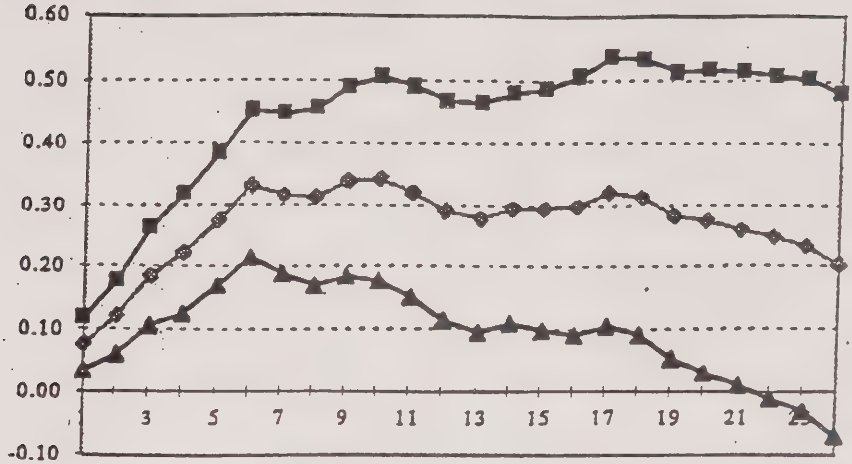


Figure 6 B

Sic 270 Response of employment to hours Pre-period.



Sic 270 Response of employment to hours Post-period.

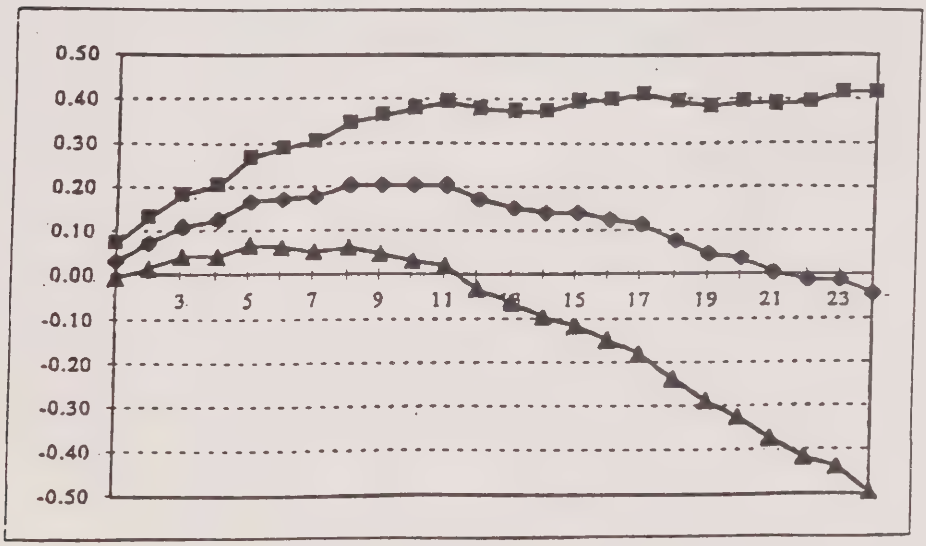
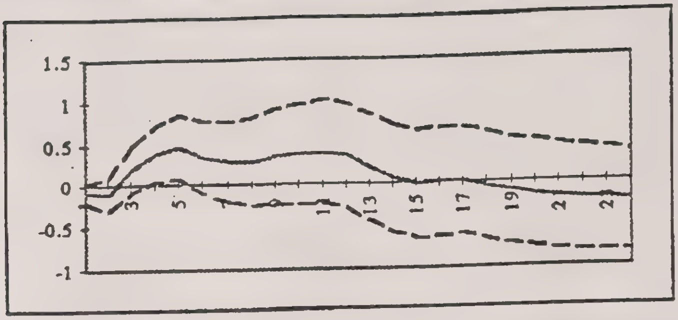


Figure 5 c

Sic 240 Response of employment to hours Pre Period



Sic 240 Response of employment to hours Post Period

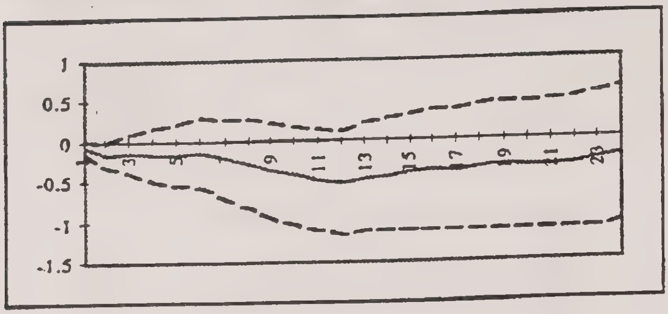
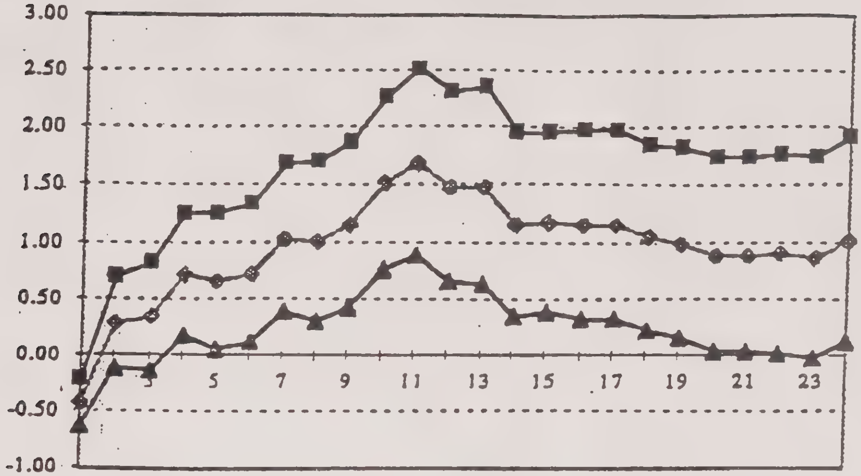


Figure 6D

Sic 370 Response of employment to hours Pre-period.



Sic 370 Response of employment to hours Post-period.

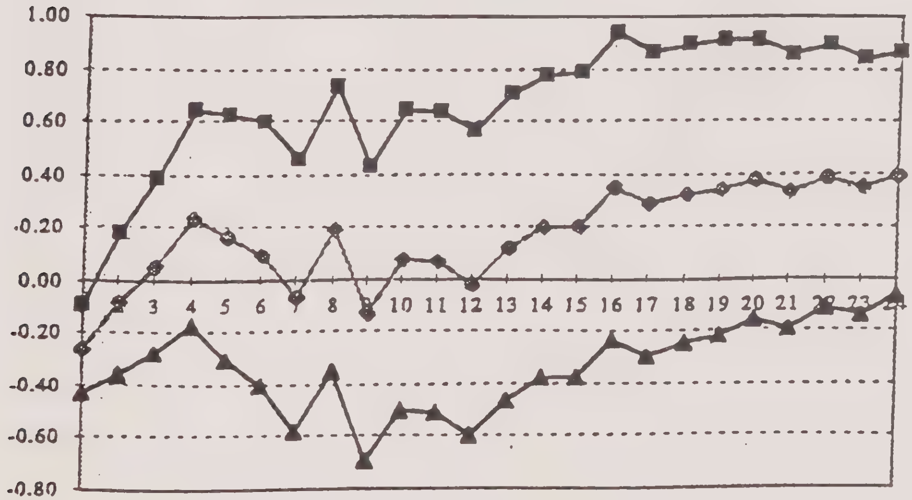


Table 1A

Table [illegible]: Changes in Peak Value of Impulse Response to AWH shock,
Using 95% Confidence Interval , Pre-1979 Vs. Post-1979
(Total Number of Industries. n=20)

Pre-1979: Post-1979:	Significant, Significant	Significant, Insignificant	Insignificant, Insignificant	Insignificant, Significant
Output	7[a]	10	2	1
Employment	11[b]	8	1	0
	SIC#			
Output	21,25,26,28,33,35, 331	22, 23, 24, 27, 30, 34, 37, 201, 314, 371	20, 39	32
Employment	20,21,22,25,27, 30,32,33,35, 314, 331	23, 24, 26, 28, 34, 37, 39, 371	201	

[a] Six of the seven peak values declined in magnitude.

[b] Seven of the eleven peak values declined in magnitude.

Table 1B

Table [illegible]: Peak Value of Employment and Output Impulse Responses, Detailed SIC Industries (Standard Errors at peak in parentheses)

SIC #	INDUSTRY	OUTPUT		EMP	
		PRE-1979	POST-1979	PRE-1979	POST-1979
DURABLES		1.268 (0.323)	0.448 (0.216)	1.028 (0.257)	0.436 (0.276)
NONDURB		0.263 (0.099)	0.081 (0.099)	0.294 (0.066)	0.094 (0.068)
200	FOOD	0.156 (0.086)	0.083 (0.072)	0.212 (0.074)	0.175 (0.053)
210	TOBACCO	0.664 (0.221)	0.809 (0.361)	0.691 (0.221)	0.713 (0.207)
220	TEXTILES	0. 590 (0.184)	0.231 (0.282)	0.245 (0.095)	0.469 (0.177)
230	APPAREL	0.363 (0.159)	-0.0 (0.0)	0.461 (0.102)	0.203 (0.128)
240	LUMBER	0.672 (0.249)	0.009 (0.567)	0.465 (0.188)	-0.138 (0.218)
250	FURNITURE	0.674 (0.250)	0.592 (0.193)	0.702 (0.166)	0.320 (0.125)
260	PAPER	0.794 (0.219)	0.380 (0.146)	0.441 (0.127)	0.176 (0.118)
270	PRINTING	0.571 (0.166)	0.246 (0.138)	0.343 (0.082)	0.207 (0.094)
280	CHEMICALS	0.887 (0.168)	0.236 (0.088)	0.496 (0.128)	0.158 (0.080)
300	RUBBER	1.059 (0.410)	0.248 (0.210)	0.950 (0.333)	0.509 (0.140)
320	STONE/CLAY/GLS	0.236 (0.149)	0.720 (0.272)	0.360 (0.120)	0.510 (0.204)
330	PRIM METALS	4.079 (0.634)	1.976 (0.398)	2.122 (0.348)	1.654 (0.448)
340	FABRIC METAL	0.679 (0.338)	0.384 (0.241)	0.637 (0.278)	0.366 (0.289)
350	MACHINERY	1.357 (0.385)	0.563 (0.202)	1.171 (0.306)	0.493 (0.237)
370	TRANSP EQPT	2.061 (0.566)	0.666 (0.400)	1.703 (0.411)	0.400 (0.232)
390	MISC	0.216 (0.254)	0.116 (0.398)	0.550 (0.123)	0.136 (0.099)
3-Digit:					
201	MEAT	0.276 (0.148)	0.143 (0.138)	-0.098 (0.087)	-0.065 (0.033)
314	SHOES	1.190 (0.243)	1.154 (0.601)	0.589 (0.080)	0.854 (0.339)
331	STEEL	6.911 (1.199)	3.001 (0.629)	4.405 (0.735)	2.149 (0.627)
371	AUTO	3.351 (0.858)	1.272 (0.834)	2.700 (0.644)	0.812 (0.487)

table 2

Table 5: INDUSTRY EMPLOYMENT % SHARE OF TOTAL EMPLOYMENT

SIC	INDUSTRY	1977	1987
200	FOOD	8.9 %	8.8 %
210	TOBACCO	0.6	0.3
220	TEXTILES	6.3	4.9
230	APPAREL	8.5	7.2
240	LUMBER	4.5	4.5
250	FURNITURE	2.5	2.9
260	PAPER	3.7	3.9
270	PRINTING	4.6	6.0
280	CHEMICALS	4.2	4.5
290	PETROLEUM	1.0	0.9
300	RUBBER	3.1	4.9
310	LEATHER	2.1	1.1
320	STONE/CLAY/GLASS	3.6	3.3
330	PRIM METALS	7.2	4.9
340	FABRIC METALS	8.0	8.1
350	MACHINERY	9.0	10.0
370	TRANSP EQPMT	9.3	9.2
390	MISC MFG	2.4	2.1
Selected 3-Digit			
201	MEAT	2.0	2.5
314	SHOES	0.2	0.1
331	STEEL	3.7	2.0
371	AUTOS	4.7	4.8

Table 5 A

Standardized differences (D) in the employment response.

Unordered

	1	2	3	4	5	6	12	24
200	-3.18	-3.70	-4.28	-3.12	-1.70	-1.64	-1.23	-0.71
210	-1.62	-1.89	-0.90	-2.75	-3.00	-3.45	0.16	1.52
220	0.40	-0.70	-1.16	-1.30	-1.75	-1.90	0.05	-0.99
230	0.34	0.73	0.19	0.45	-0.01	0.15	-0.16	-0.77
240	0.14	1.24	0.78	-0.17	-0.71	-0.63	0.55	1.39
250	-0.68	-1.12	-1.86	-2.75	-2.86	-2.45	-2.21	-2.14
260	-2.42	-3.11	-3.69	-2.89	-2.45	-2.06	0.64	1.08
270	-0.01	-0.12	0.78	1.68	0.78	0.02	-0.38	-1.02
280	-2.91	-2.09	-0.55	0.34	0.39	0.63	1.62	-0.06
300	-9.37	-6.33	-4.35	-3.36	-2.23	-1.20	-0.77	0.20
320	-5.36	-2.32	-0.14	0.87	1.50	2.02	1.30	2.14
330	-4.52	-3.91	-2.34	-1.33	-0.93	-0.70	0.99	-0.25
340	-3.21	-3.63	-2.82	-2.23	-1.51	-1.79	-1.08	-1.23
350	-5.90	-5.14	-3.82	-3.21	-2.66	-2.61	-1.85	-2.82
370	-8.86	-6.23	-3.76	-2.20	-2.57	-2.17	-1.45	-1.06
390	2.62	3.46	3.94	3.46	3.06	3.09	0.30	-0.07
TM	-5.19	-3.69	-2.91	-2.03	-1.98	-2.16	-0.79	-1.45
DM	-5.95	-4.91	-3.29	-1.97	-1.91	-2.35	-1.13	-0.85
NDM	-1.63	-1.59	-2.44	-2.10	-2.06	-1.57	0.77	-1.19

Rankings in ascending order:

After 1 month		After 2 months								After 6 months	
300	-9.37	300	-6.33	300	-4.35	300	-3.36	210	-3.00	210	3.45
370	-8.86	370	-6.23	200	-4.28	350	-3.21	250	-2.86	350	-2.61
350	-5.90	350	-5.14	350	-3.82	200	-3.12	350	-2.66	250	-2.45
320	-5.36	330	-3.91	370	-3.76	260	-2.89	370	-2.57	370	-2.17
330	-4.52	200	-3.70	260	-3.69	210	-2.75	260	-2.45	260	-2.06
340	-3.21	340	-3.63	340	-2.82	250	-2.75	300	-2.23	220	-1.90
200	-3.18	260	-3.11	330	-2.34	340	-2.23	220	-1.75	340	-1.79
280	-2.91	320	-2.32	250	-1.86	370	-2.20	200	-1.70	200	-1.64
260	-2.42	280	-2.09	220	-1.16	330	-1.33	340	-1.51	300	-1.20
210	-1.62	210	-1.89	210	-0.90	220	-1.30	330	-0.93	330	-0.70
250	-0.68	250	-1.12	280	-0.55	240	-0.17	240	-0.71	240	-0.63
270	-0.01	220	-0.70	320	-0.14	280	0.34	230	-0.01	270	0.02
240	0.14	270	-0.12	230	0.19	230	0.45	280	0.39	230	0.15
230	0.34	230	0.73	270	0.78	320	0.87	270	0.78	280	0.63
220	0.40	240	1.24	240	0.78	270	1.68	320	1.50	320	2.02
390	2.62	390	3.46	390	3.94	390	3.46	390	3.06	390	3.09
TM	-5.19	TM	-3.69	TM	-2.91	TM	-2.03	TM	-1.98	TM	-2.16
DM	-5.95	DM	-4.91	DM	-3.29	NDM	-2.10	NDM	-2.06	DM	-2.35
NDM	-1.63	NDM	-1.59	NDM	-2.44	DM	-1.97	DM	-1.91	NDM	-1.57

Note: $|D| > 1.645$ denotes significance at .10 level
$|D| > 1.96$ denotes significance at .05 level

Table 3 B

Standardized differences in Hours Response: Unordered

	1	2	3	4	5	6	12	24
200	-0.44	-0.10	-0.50	1.64	1.00	1.05	1.62	1.12
210	-1.52	1.15	1.53	0.79	0.98	1.50	0.97	0.64
220	0.37	0.88	0.65	0.94	0.21	-0.38	-0.23	-1.19
230	3.69	3.03	0.92	0.43	-0.65	-0.73	0.29	0.20
240	2.32	1.58	0.52	0.98	-0.04	-0.95	1.14	0.95
250	1.07	0.65	0.04	0.18	-0.36	-0.61	-1.79	-0.23
260	-0.71	-0.43	-0.28	-0.09	0.47	0.81	2.64	0.72
270	1.07	-1.34	-0.42	-1.17	-0.42	-0.30	0.29	-0.57
280	0.64	1.24	1.84	0.98	1.61	1.55	2.28	-0.13
300	-1.14	-0.24	0.86	0.66	1.50	1.10	0.65	0.60
320	0.96	0.08	0.10	0.54	1.20	1.22	0.21	0.41
330	-2.06	-0.92	-0.58	-0.25	-0.04	0.12	1.20	-0.29
340	1.58	0.21	-0.06	0.82	0.59	1.13	-0.37	-0.86
350	-0.01	-0.73	-0.27	-2.27	-2.36	-1.35	-1.28	-1.02
370	0.56	-2.86	-0.47	0.18	-0.81	-0.21	-0.91	-0.03
390	0.92	0.68	0.66	-0.94	-0.39	-0.54	-2.62	0.12
TM	1.26	-0.50	-0.23	1.06	-0.62	0.56	-0.33	-1.47
DM	2.02	0.04	-0.05	1.01	-1.04	0.61	-0.37	-0.57
NDM	-0.28	0.45	0.63	0.88	0.63	1.73	1.22	-1.46

Rankings in descending order:

After 1 month		After 2 months								After 5 month	
230	3.69	230	3.03	280	1.84	200	1.64	280	1.61	280	1.55
240	2.32	240	1.58	210	1.53	280	0.98	300	1.50	210	1.50
340	1.58	280	1.24	230	0.92	240	0.98	320	1.20	320	1.22
250	1.07	210	1.15	300	0.86	220	0.94	200	1.00	340	1.13
270	1.07	220	0.88	390	0.66	340	0.82	210	0.98	300	1.10
320	0.96	390	0.68	220	0.65	210	0.79	340	0.59	200	1.05
390	0.92	250	0.65	240	0.52	300	0.66	260	0.47	260	0.81
280	0.64	340	0.21	320	0.10	320	0.54	220	0.21	330	0.12
370	0.56	320	0.08	250	0.04	230	0.43	330	-0.04	370	-0.21
220	0.37	200	-0.10	340	-0.06	250	0.18	240	-0.04	270	-0.30
350	-0.01	300	-0.24	350	-0.27	370	0.18	250	-0.36	220	-0.38
200	-0.44	260	-0.43	260	-0.28	260	-0.09	390	-0.39	390	-0.54
260	-0.71	350	-0.73	270	-0.42	330	-0.25	270	-0.42	250	-0.61
300	-1.14	330	-0.92	370	-0.47	390	-0.94	230	-0.65	230	-0.73
210	-1.52	270	-1.34	200	-0.50	270	-1.17	370	-0.81	240	-0.95
330	-2.06	370	-2.86	330	-0.58	350	-2.27	350	-2.36	350	-1.35
TM	1.26	TM	-0.50	TM	-0.23	TM	1.06	TM	-0.62	TM	0.56
DM	2.02	NDM	0.45	NDM	0.63	DM	1.01	NDM	0.63	NDM	1.73
NDM	-0.28	DM	0.04	DM	-0.05	NDM	0.88	DM	-1.04	DM	0.61

Table 4

Relative response of hours ; Before (b) and After (a) 1979:1, $= \dfrac{IR_H}{(IR_H + IR_E)}$

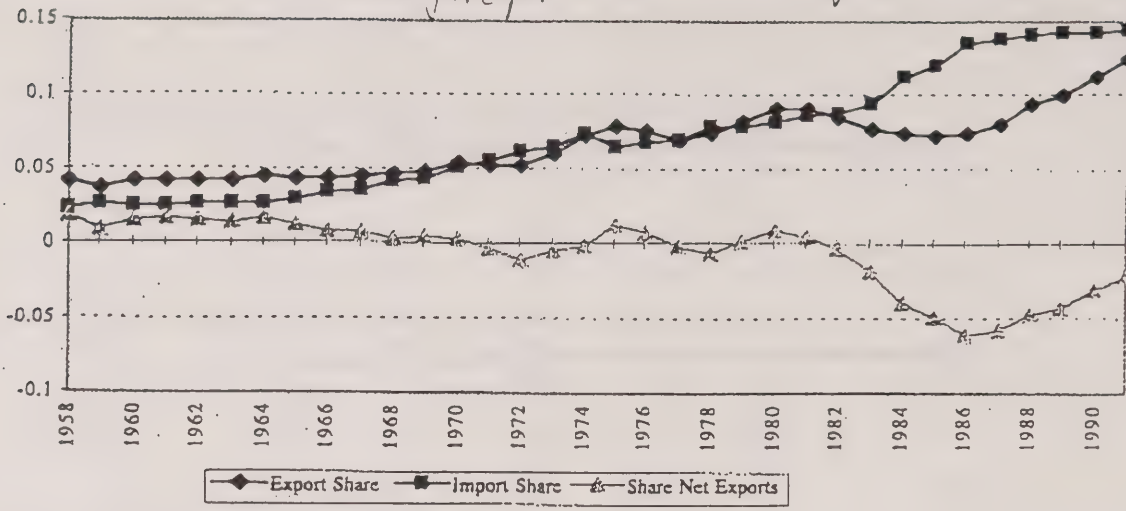
	1	2	3	6	12
b200	0.34	0.16	0.17	-0.65	-0.38
a200	0.66	4.52	-0.35	-0.33	0.33
b210	0.78	0.09	0.16	-0.14	2.31
a210	1.15	1.74	1.16	-66.23	0.34
b220	0.64	0.55	0.45	0.34	-0.03
a220	0.65	0.64	0.55	0.42	-0.16
b230	0.56	0.18	0.11	0.31	-14.06
a230	0.71	0.53	0.29	0.15	-9.22
b240	0.53	0.31	0.22	0.24	0.09
a240	0.60	0.35	0.23	0.20	0.20
b250	0.15	0.26	0.25	0.08	0.03
a250	0.47	0.47	0.50	0.38	0.77

b260	0.39	0.36	0.25	0.14	**3.82**
a260	0.45	**0.52**	0.44	0.38	0.14
b270	0.27	0.40	0.45	0.32	0.17
a270	**0.47**	-0.07	0.00	0.27	0.24
b280	0.20	0.08	0.16	0.21	-0.11
a280	**0.57**	0.34	0.36	0.30	0.22
b300	**0.21**	0.18	0.08	0.08	-0.05
a300	**0.50**	0.43	0.30	0.27	0.17
b320	0.29	0.29	0.24	0.16	-0.26
a320	**0.54**	0.39	0.25	0.19	-0.04
b330	0.32	0.28	0.24	0.16	-0.37
a330	0.37	0.36	0.29	0.20	0.11
b340	**0.36**	0.26	0.14	0.13	0.12
a340	**0.59**	0.42	0.22	0.33	0.14

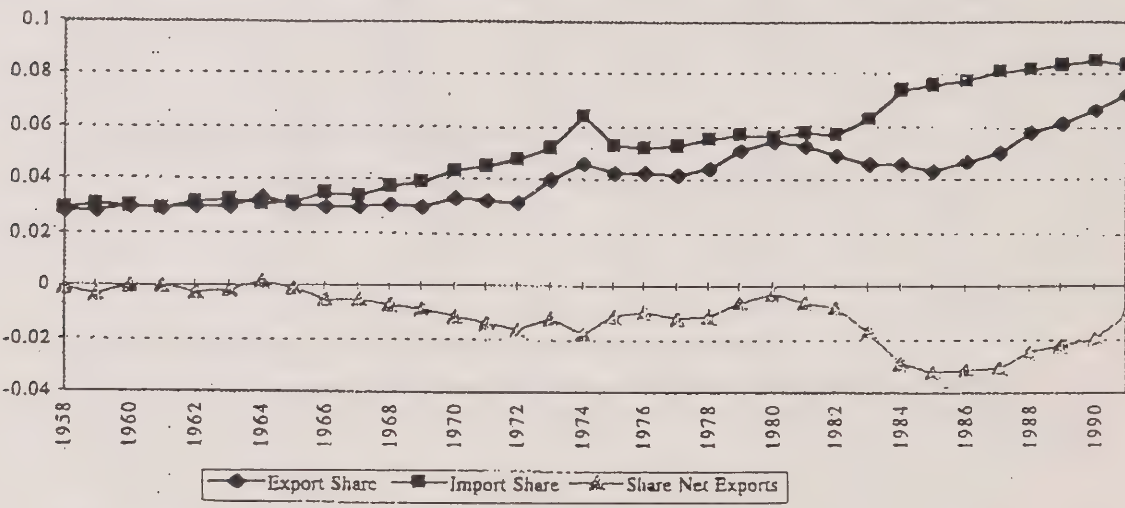
b350	**0.30**	0.29	0.20	0.25	0.14
a350	**0.79**	0.64	0.44	0.36	0.00
b370	0.21	**0.22**	0.16	0.12	0.11
a370	**0.46**	0.29	0.30	0.26	0.03
b390	0.39	0.50	0.38	**0.64**	0.21
a390	**0.31**	0.22	0.14	0.07	-0.16
bMan	**0.40**	0.31	0.21	0.15	0.12
aMan	0.64	0.41	0.28	0.31	0.12
bDur	0.32	0.24	0.18	0.14	0.13
aDur	0.60	0.40	0.28	0.29	0.14
bnDur	**0.52**	0.36	0.18	0.14	-0.54
aNDur	0.59	0.49	0.38	0.47	0.10

Figure 7: Net Export Shares by Industry

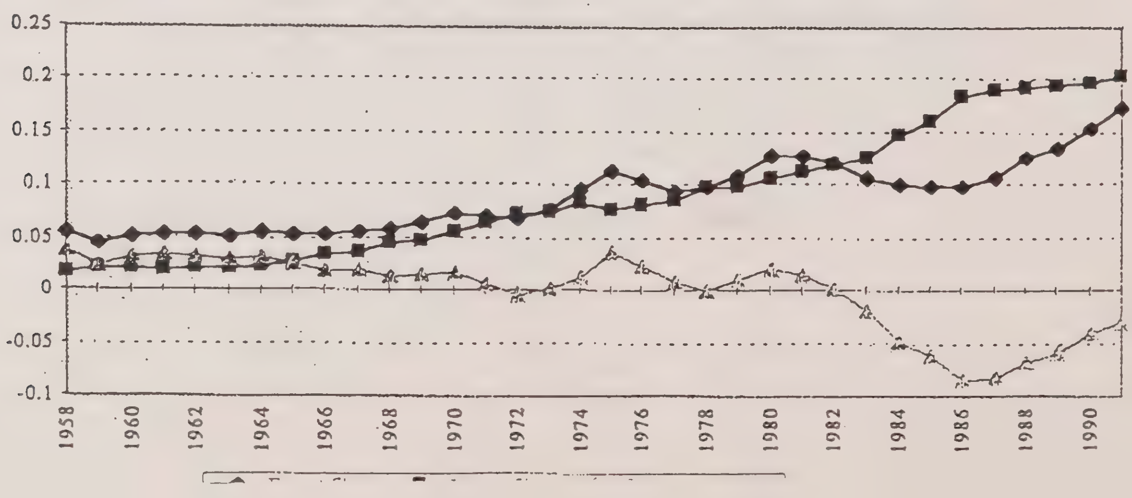
TM (Manufacturing)



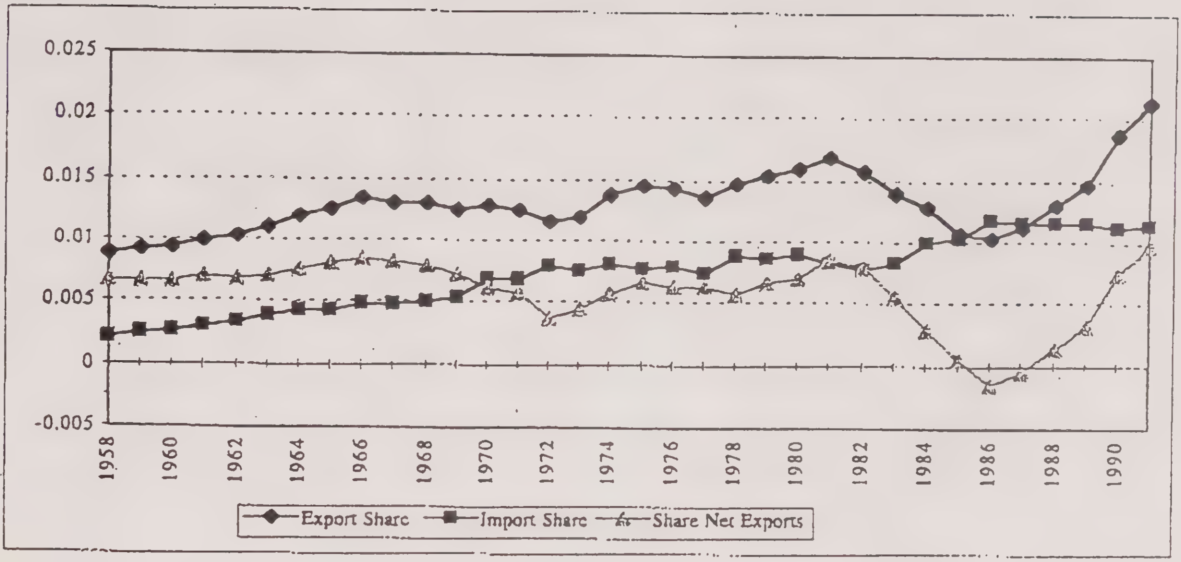
NDM (Non Durable Manufacturing)



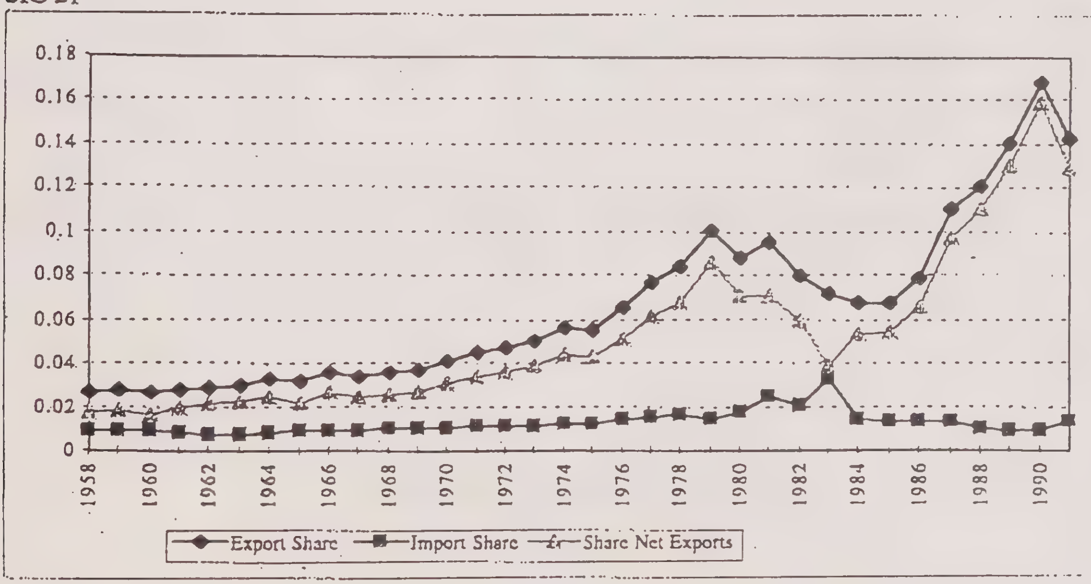
DM (Durable Manufacturing)



SIC 20


0.025
0.02
0.015
0.01
0.005
0
-0.005
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 21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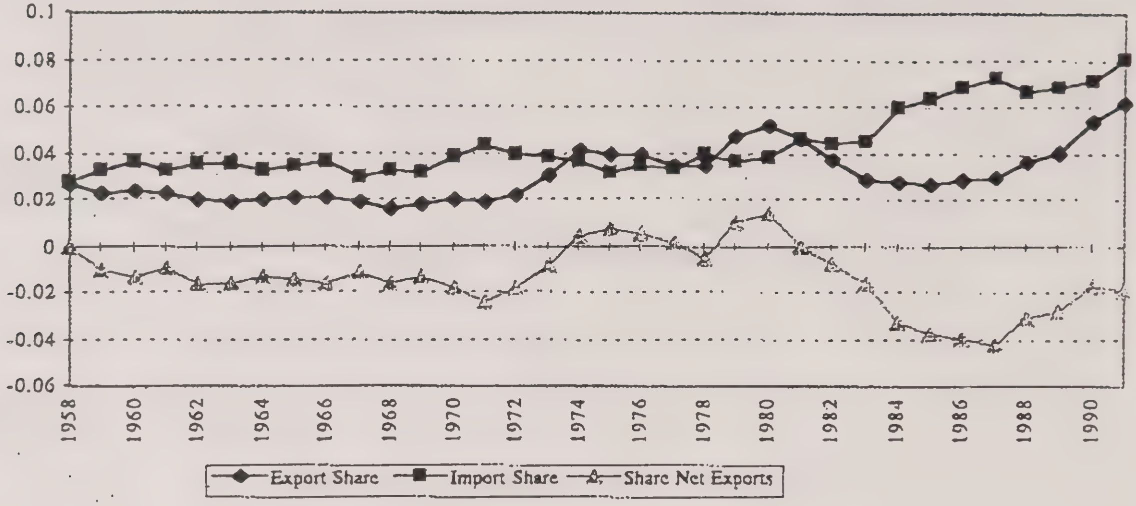
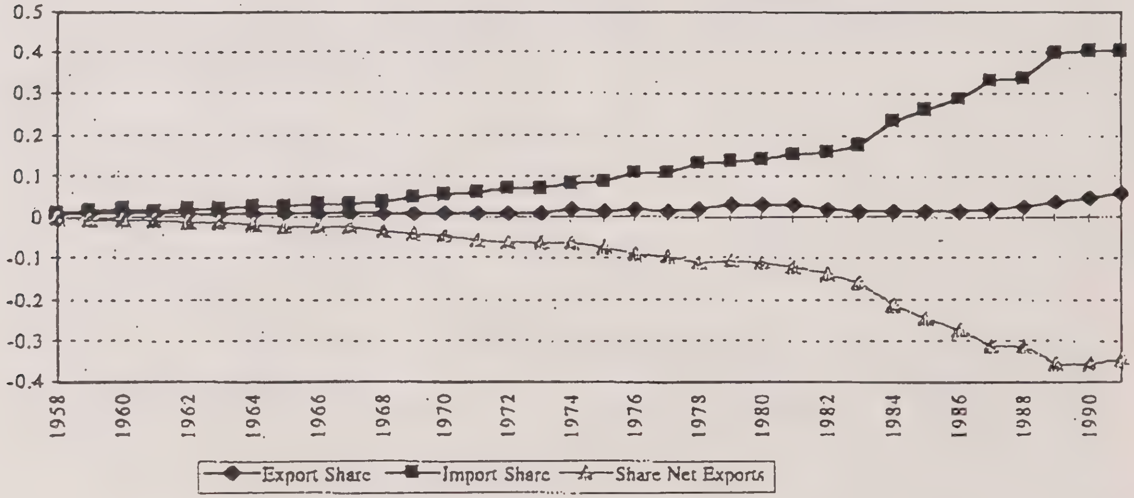
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 22



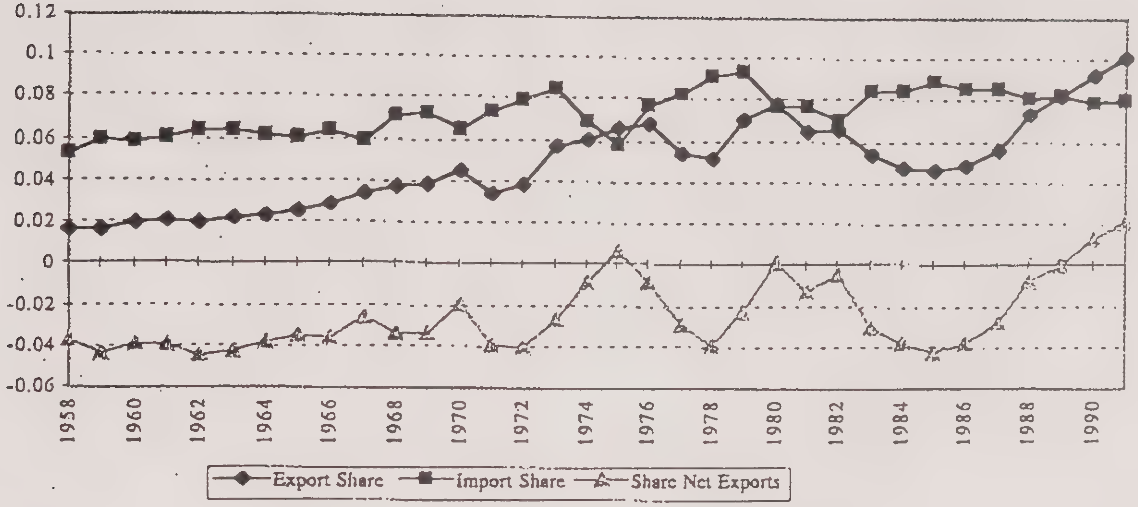
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 23



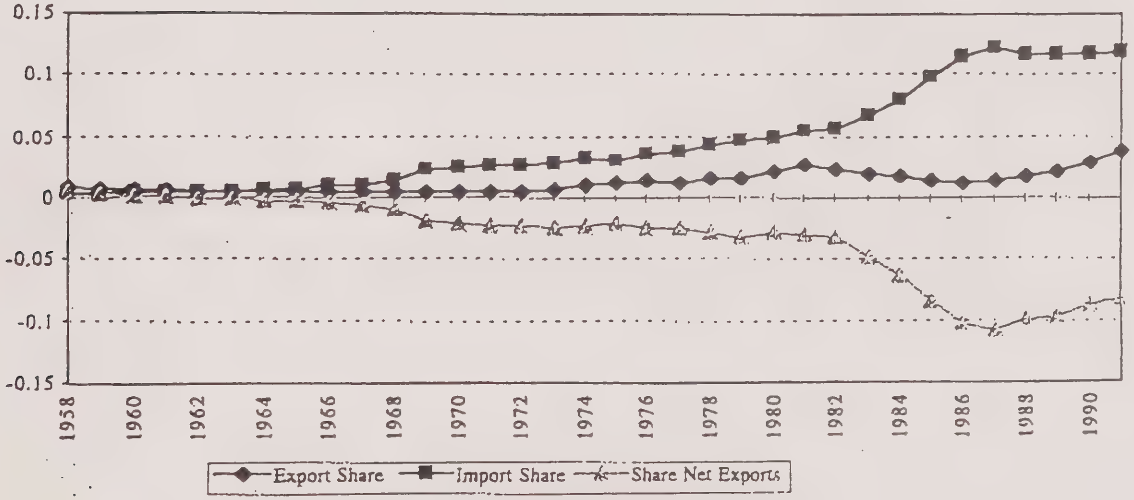
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 24



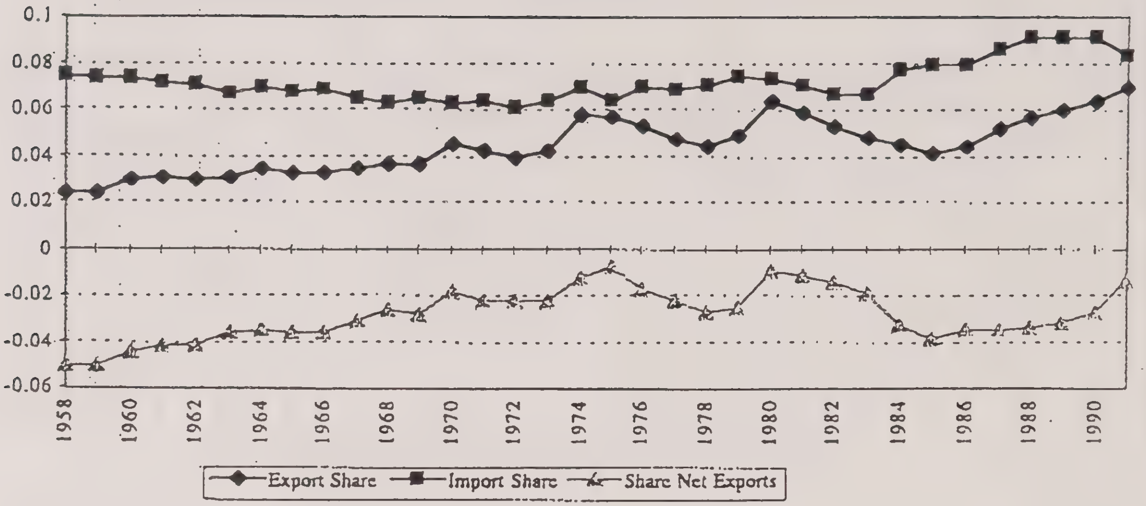
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC25

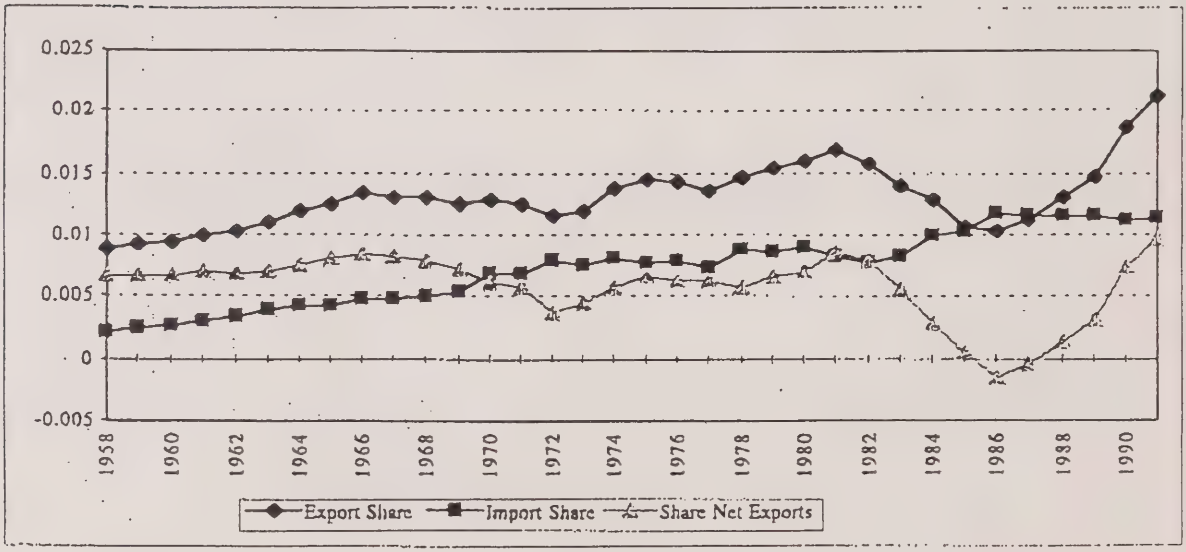


0.15
0.1
0.05
0
-0.05
-0.1
-0.15
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 26


0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 27


0.025
0.02
0.015
0.01
0.005
0
-0.005
1958
1960
1962
1964
1966
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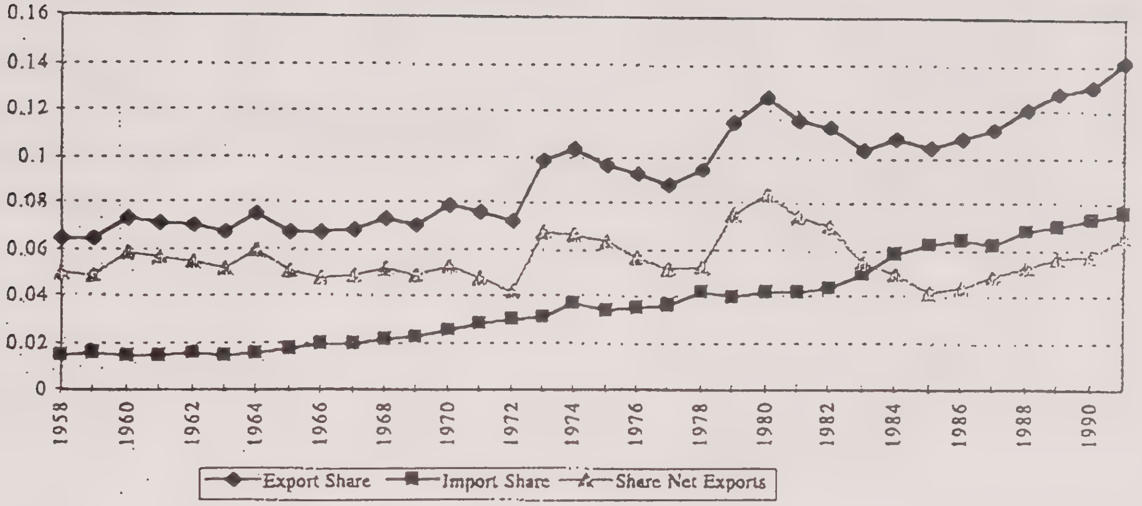
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 28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0.08
0.06
0.04
0.02
0
1958
1960
1962
1964
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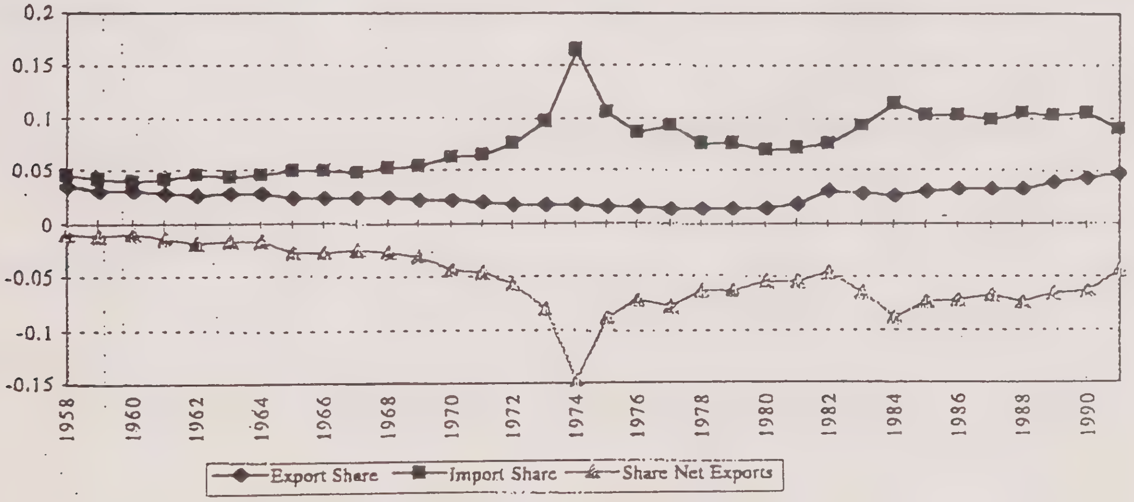
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 29


0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
1958
1960
1962
1964
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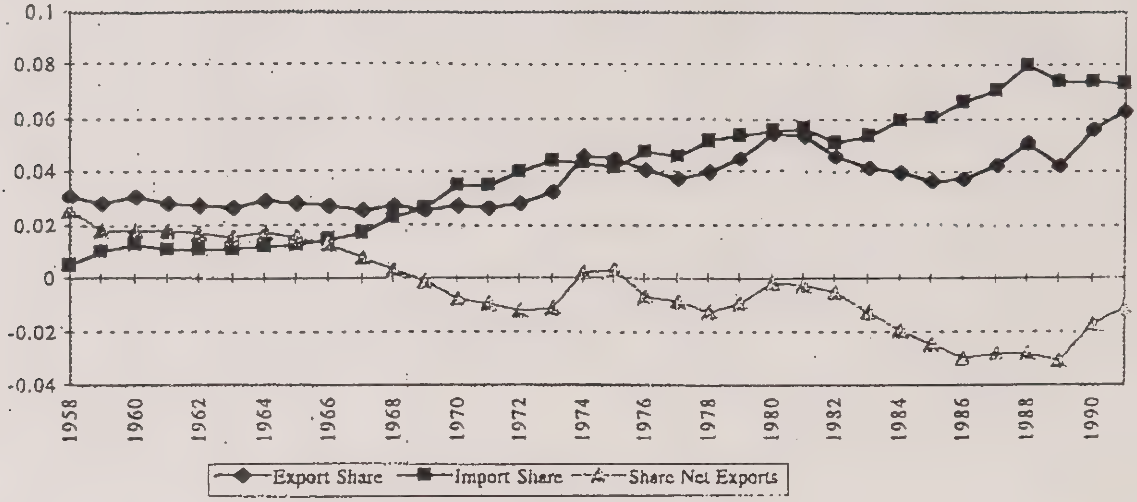
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 30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0.08
0.06
0.04
0.02
0
-0.02
-0.04
1958
1960
1962
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1972
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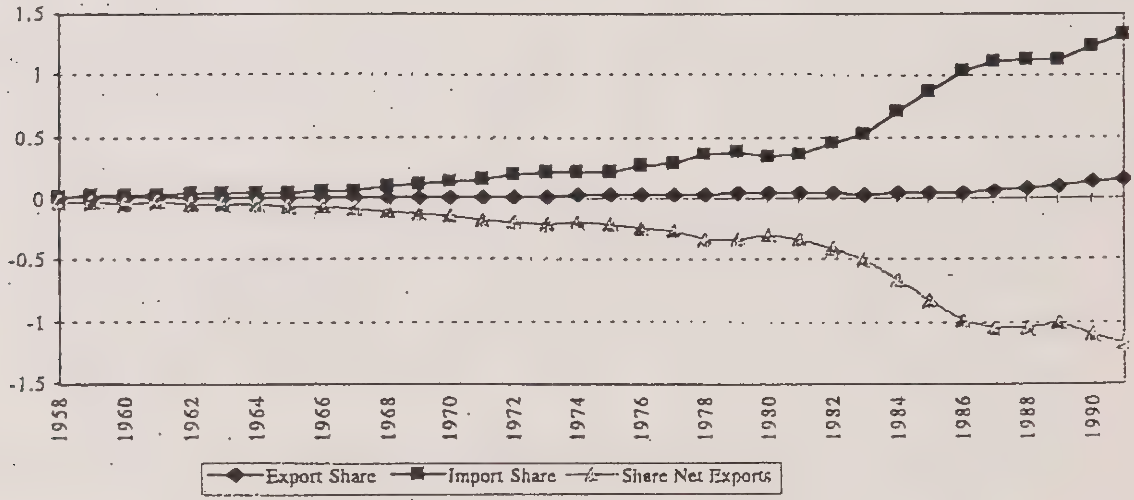
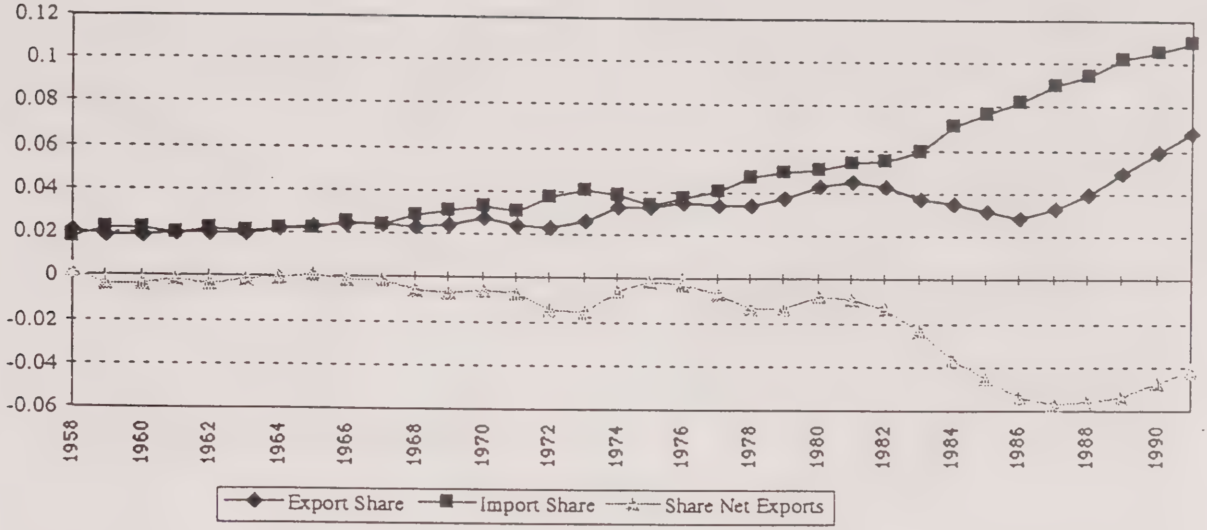
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 31


1.5
1
0.5
0
-0.5
-1
-1.5
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 32



0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
1958
1960
1962
1964
1966
1968
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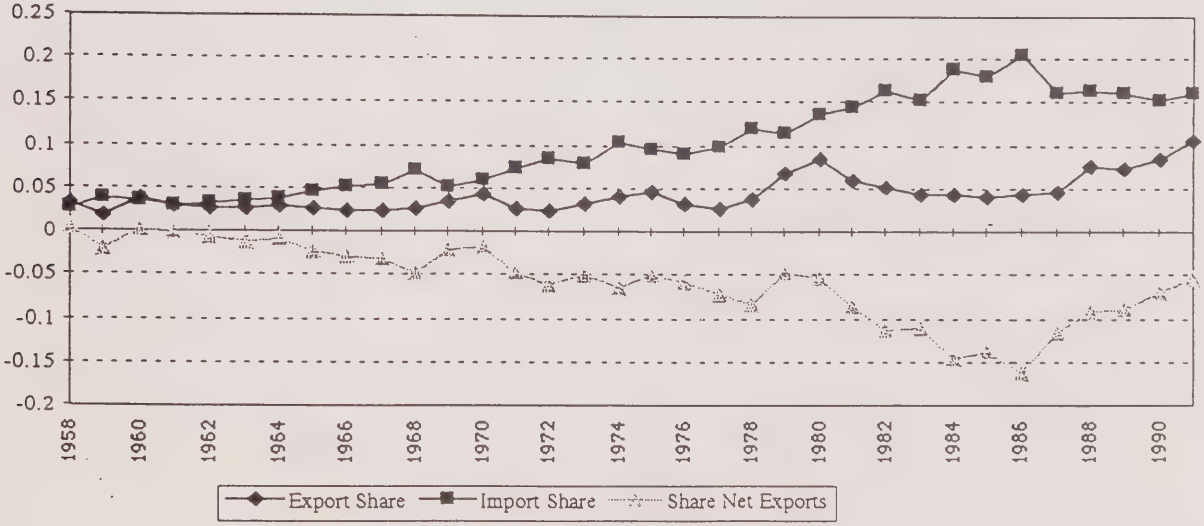
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 33



0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
1958
1960
1962
1964
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1968
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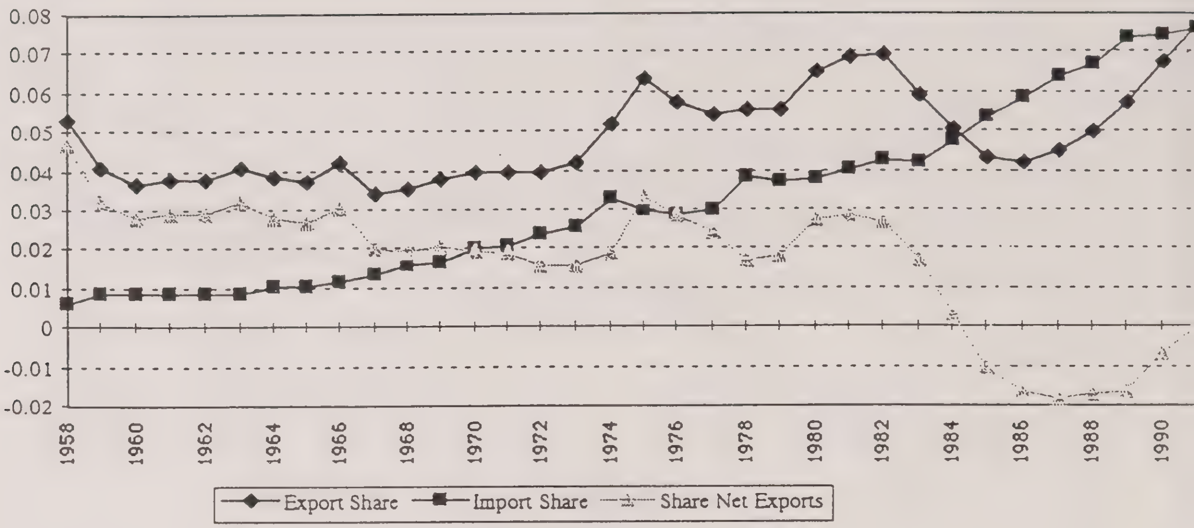
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 34



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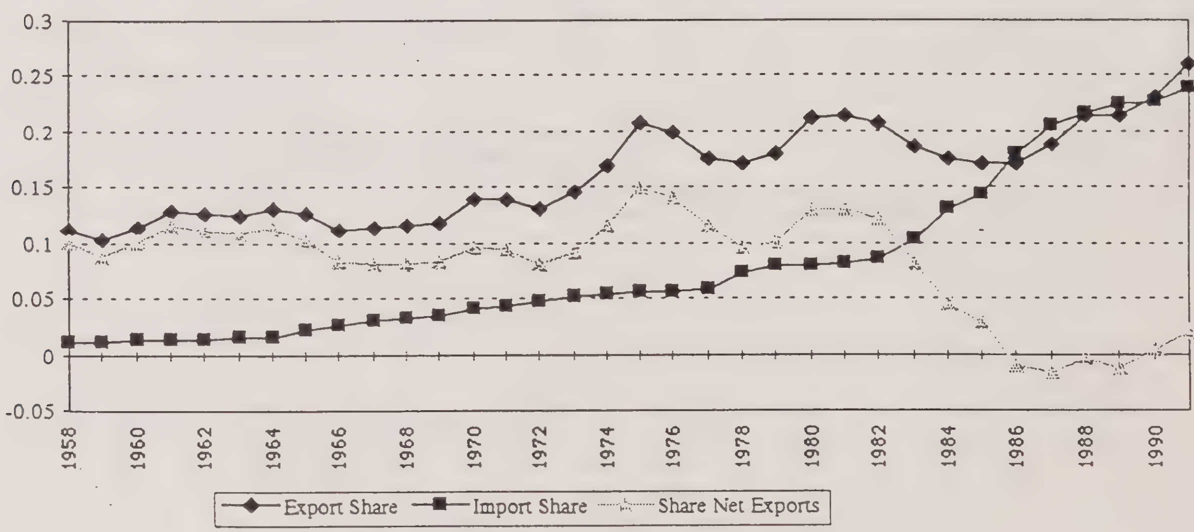
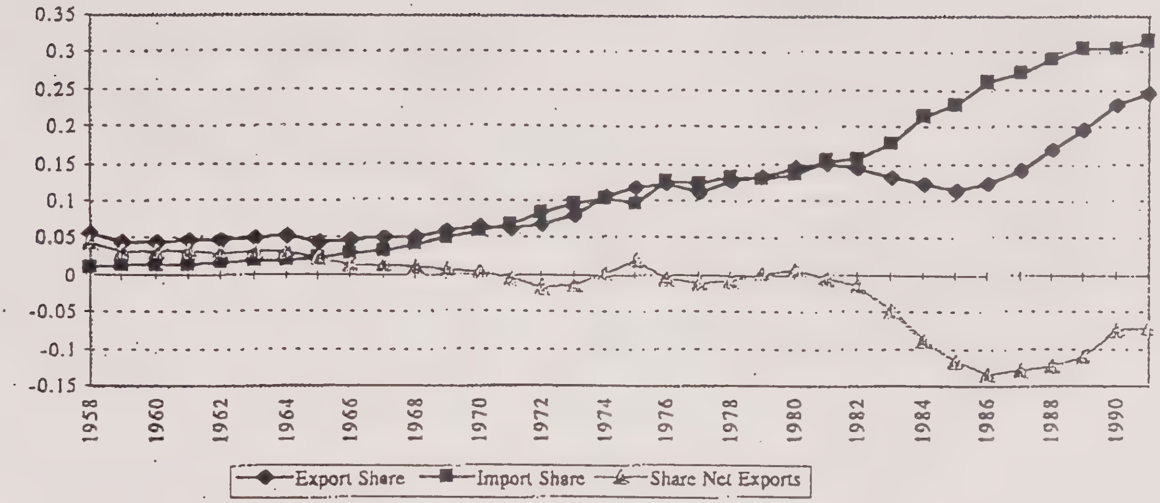
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC35



0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 36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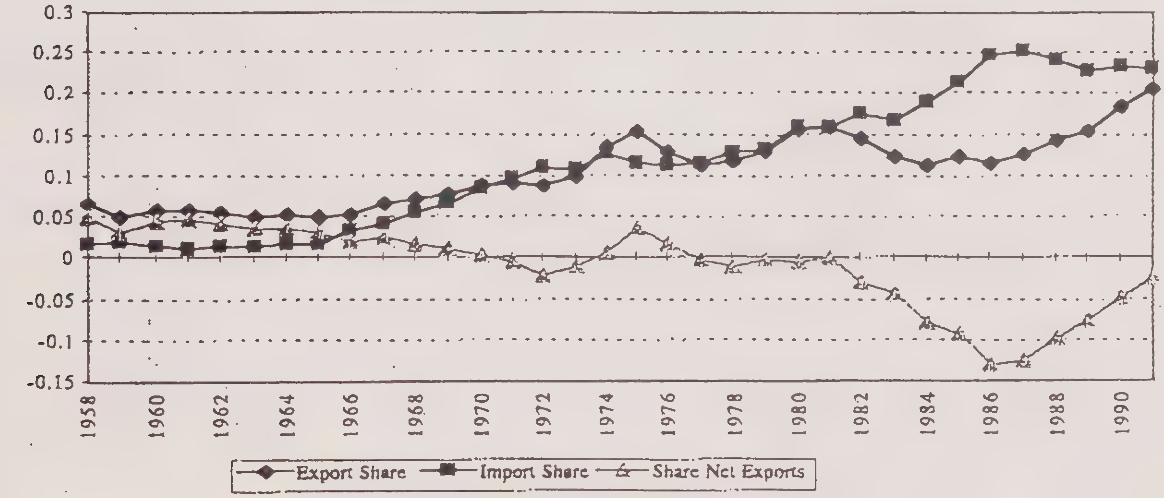
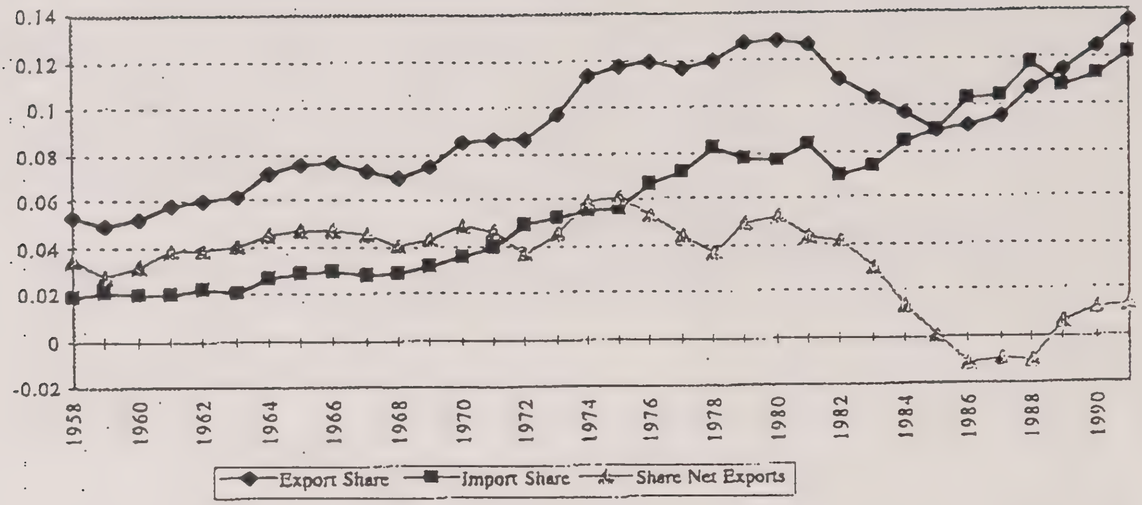
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 37


0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 38


0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
1958
1960
1962
1964
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1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

SIC 39

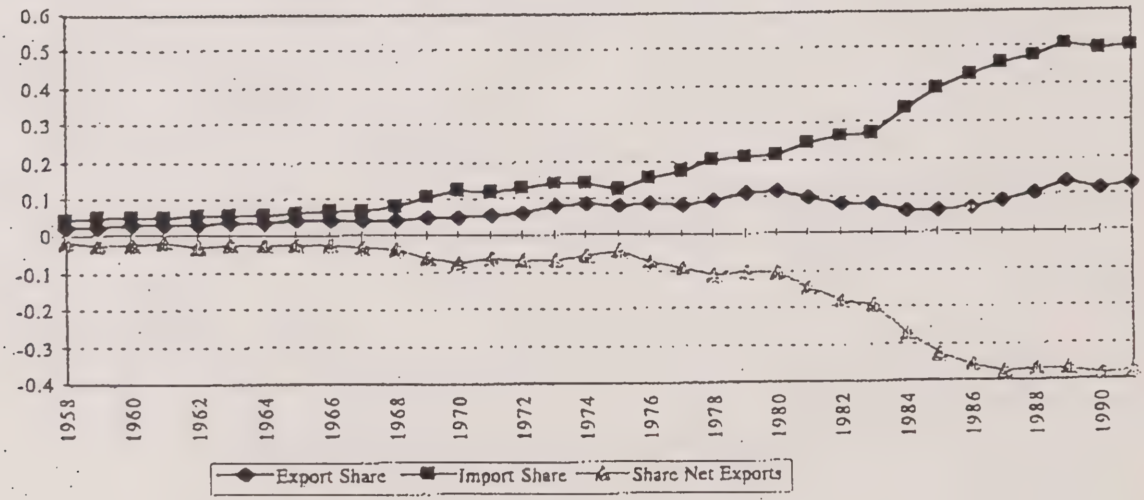
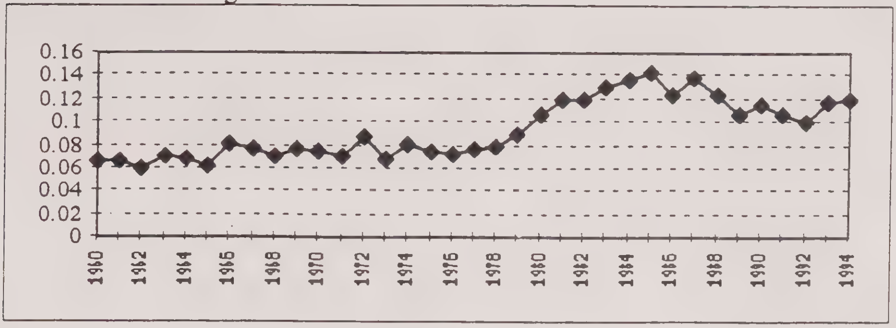
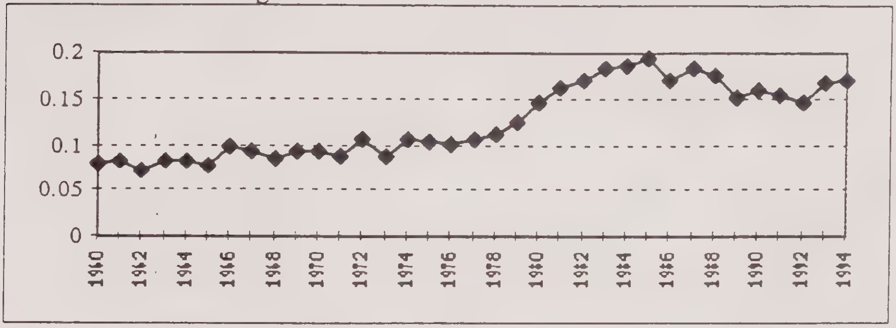

0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Export Share
Import Share
Share Net Exports

Figure 8
Computerization Spending $ per employment

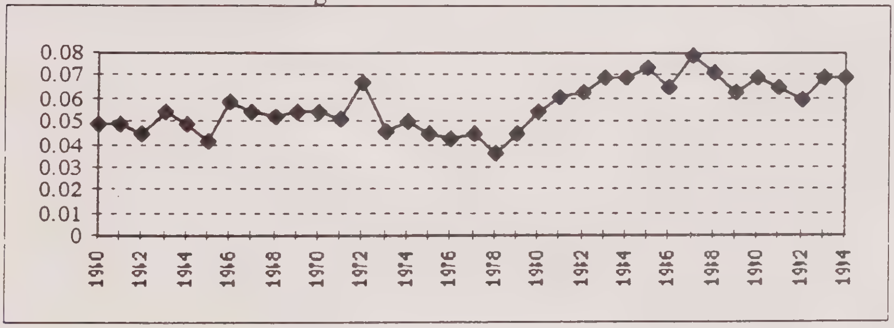
Total Manufacturing



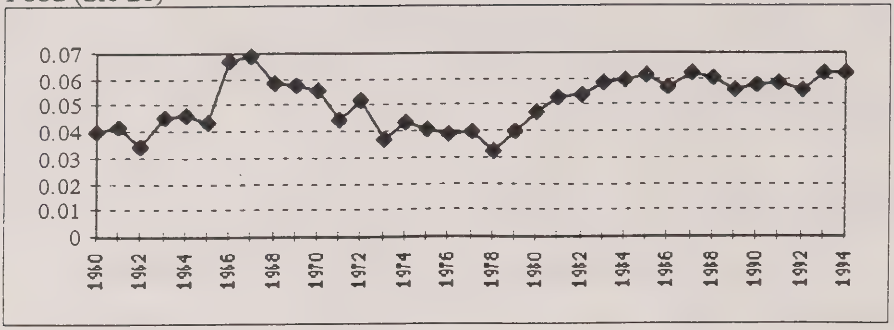
Durable Manufacturing



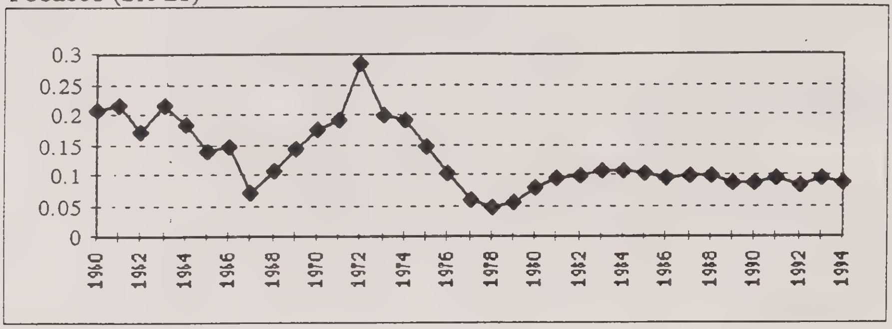
Non Durable Manufacturing



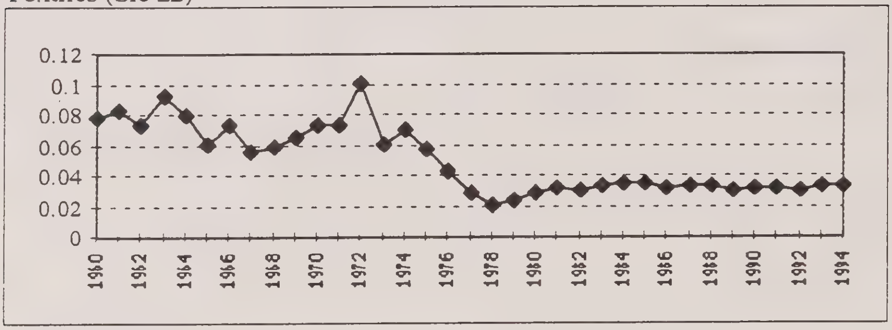
Food (Sic 20)



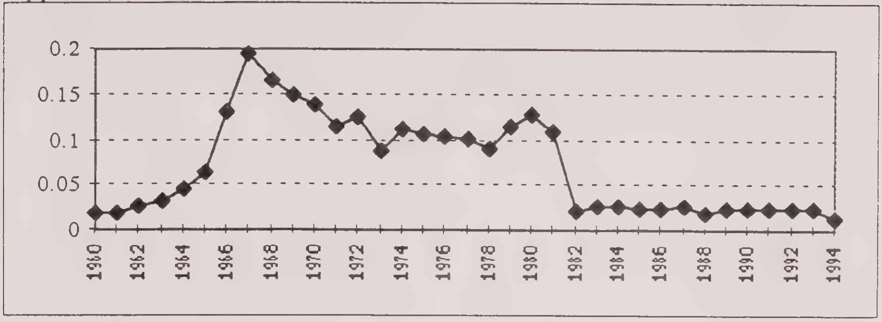
Tobacco (Sic 21)



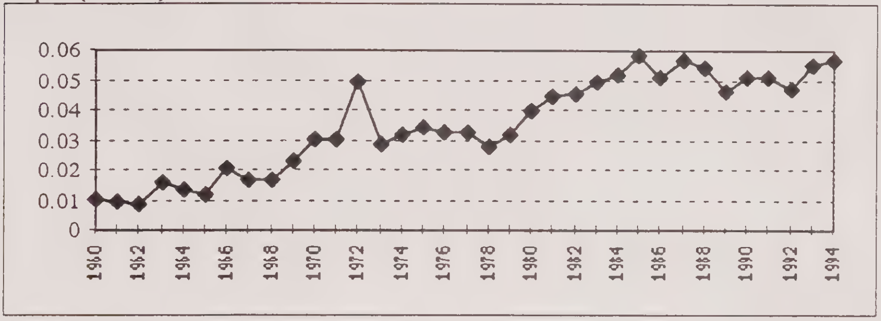
Textiles (Sic 22)



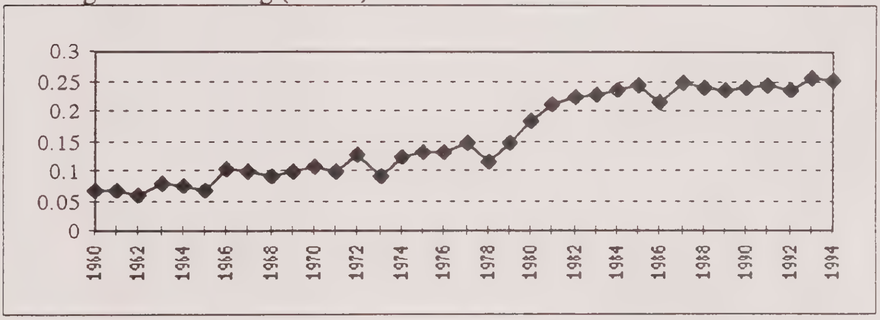
Apparel (Sic 23)



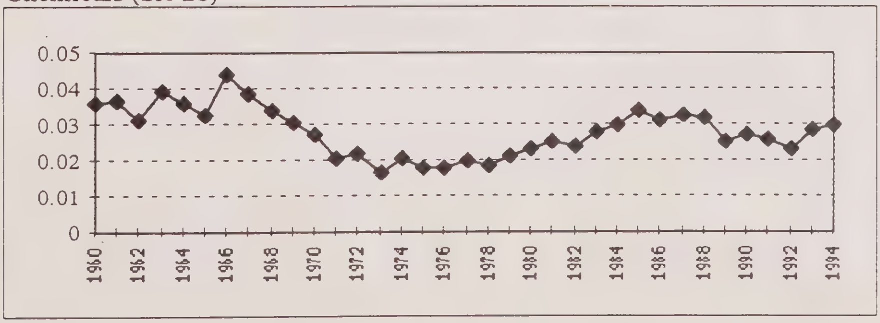
Paper (Sic 26)



Printing and Publishing (Sic 27)

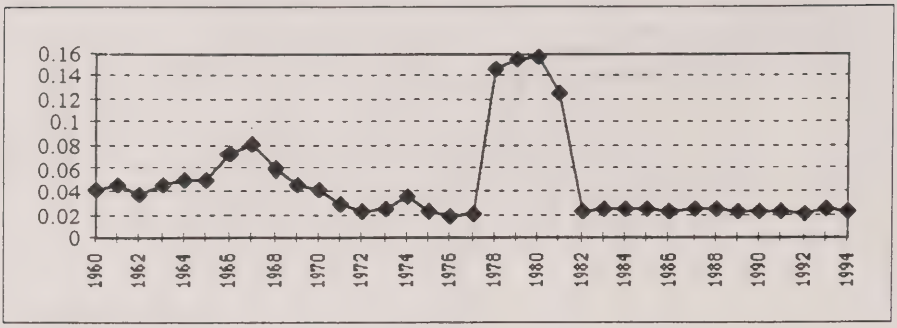


Chemicals (Sic 28)

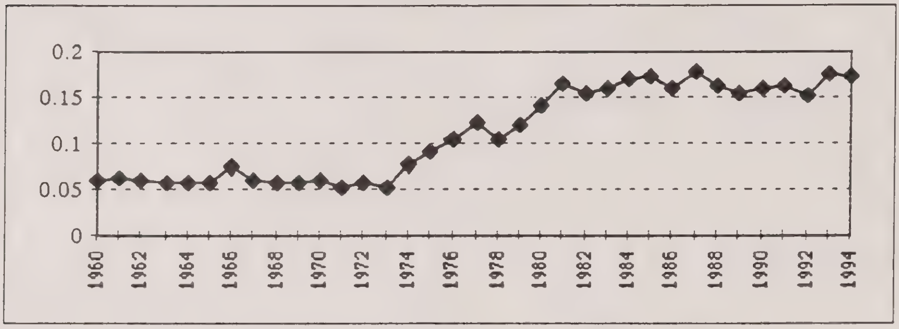


Computer Expenditures as a share of Equipment Investment.

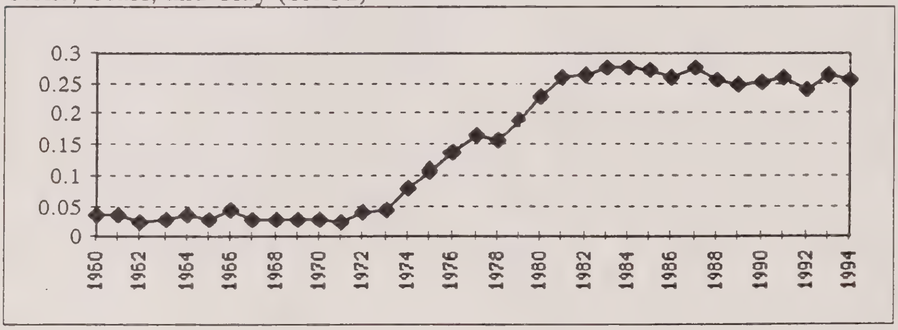
Lumber (Sic 24)



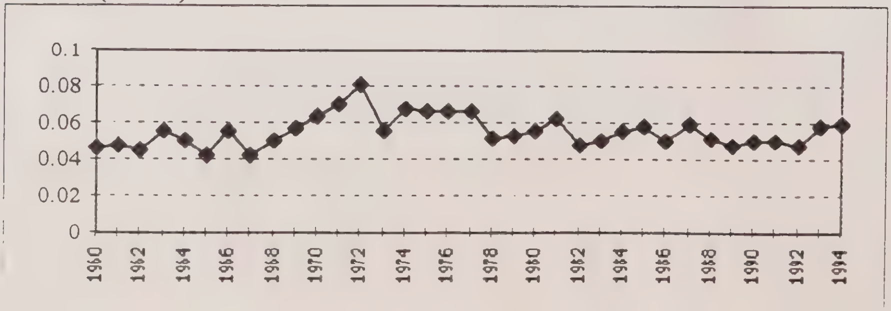
Furniture (Sic 25)



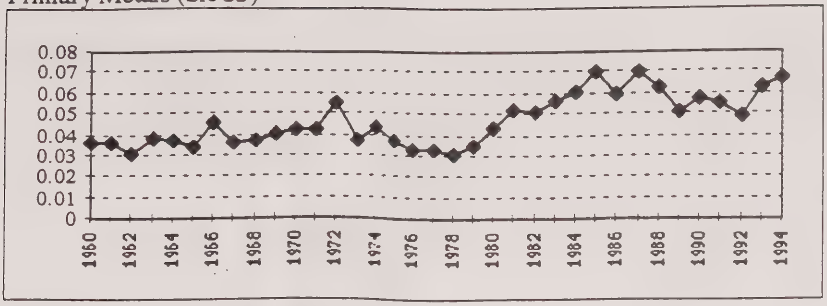
Stone, Glass, and Clay (Sic 32)



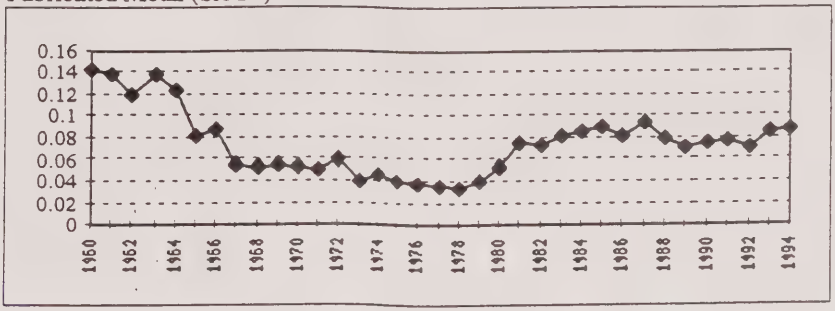
Rubber (Sic 30)



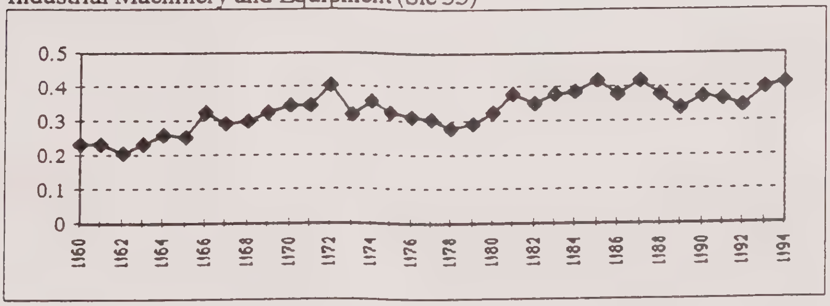
Primary Metals (Sic 33)



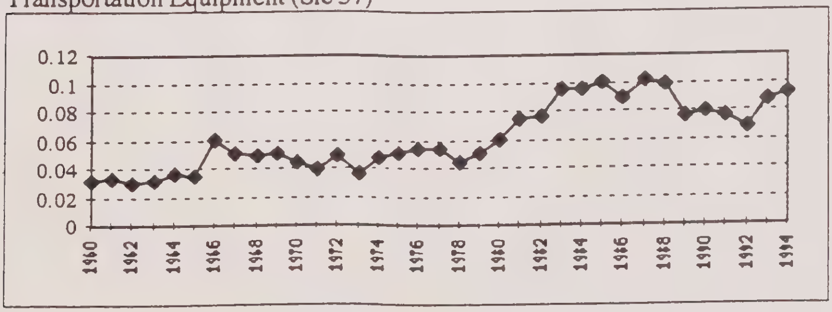
Fabricated Metal (Sic 34)



Industrial Machinery and Equipment (Sic 35)



Transportation Equipment (Sic 37)



Misc. Manufacturing (Sic 39)

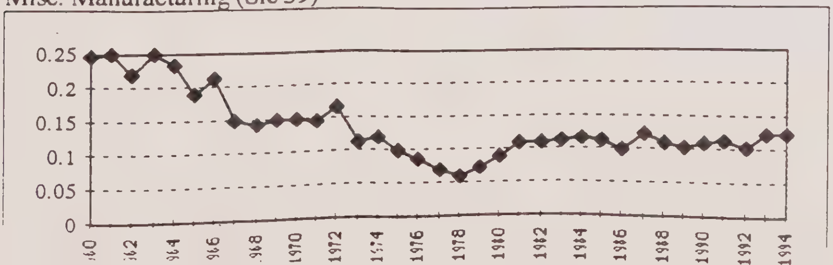
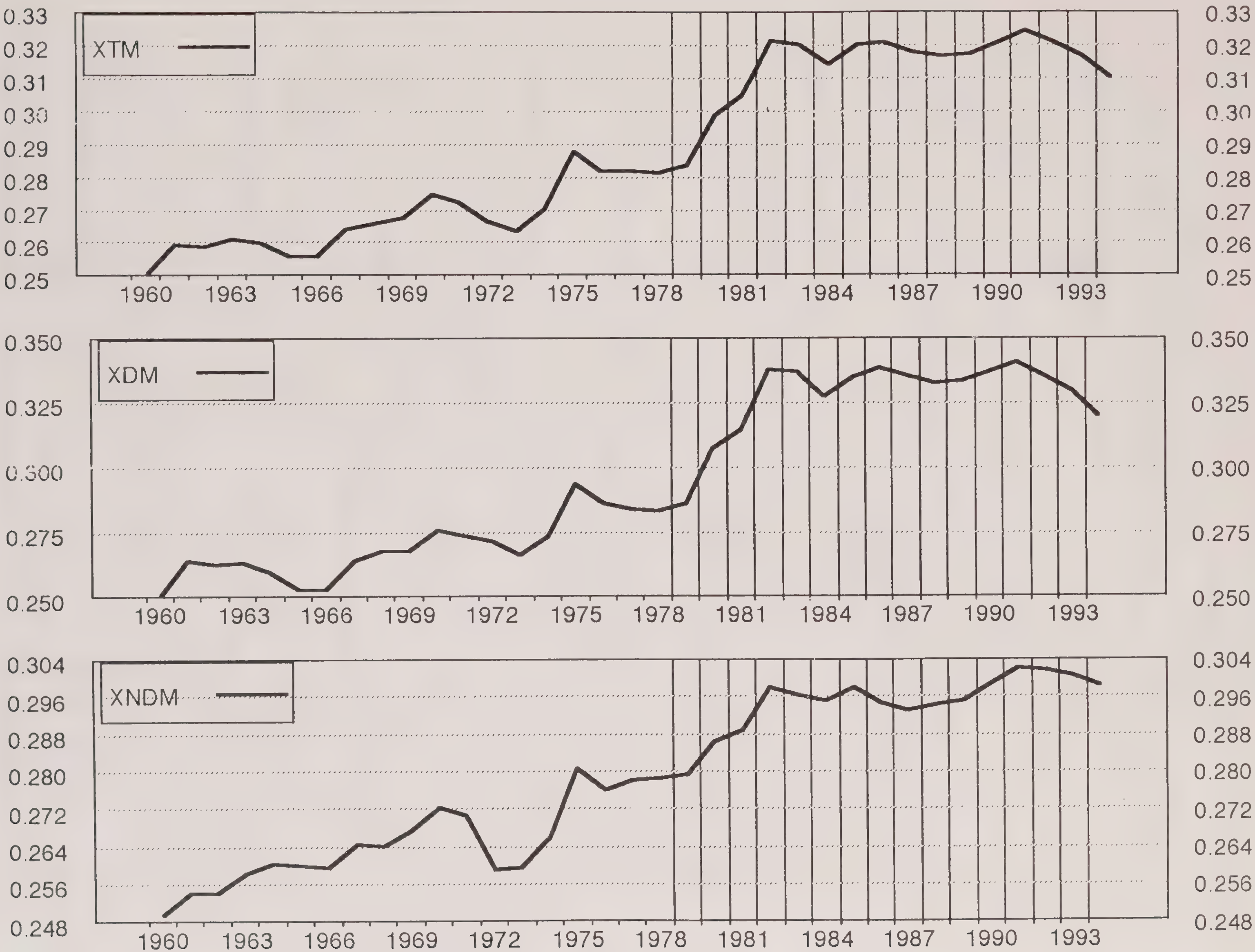
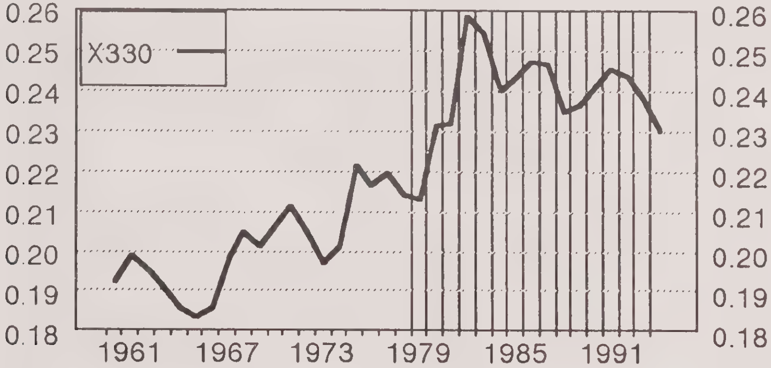
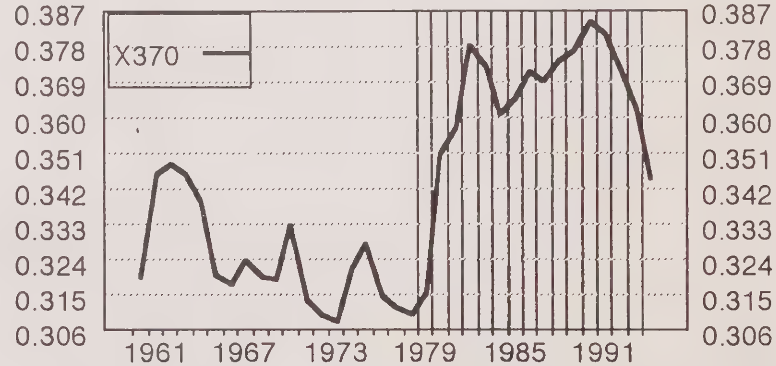


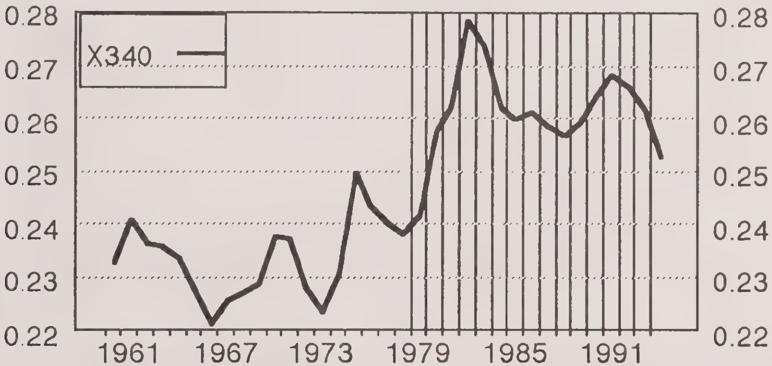
Figure 9

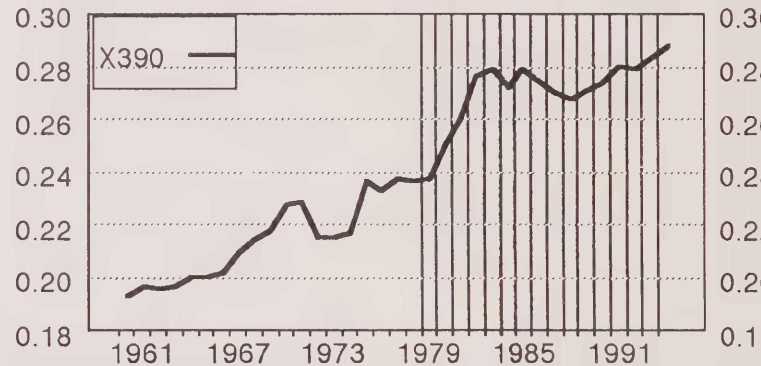


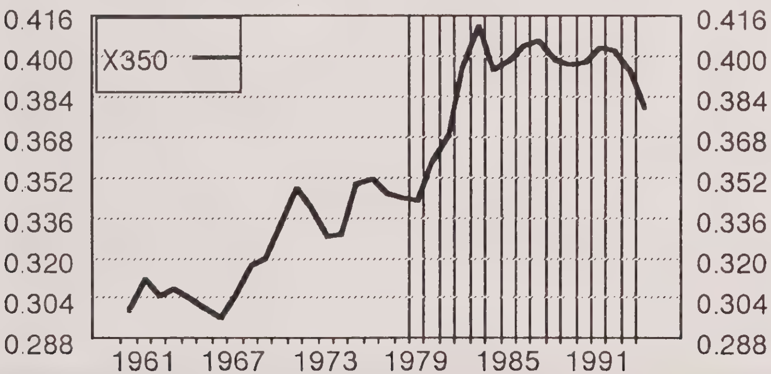
XTM
0.33
0.32
0.31
0.30
0.29
0.28
0.27
0.26
0.25
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
XDM
0.350
0.325
0.300
0.275
0.250
XNDM
0.304
0.296
0.288
0.280
0.272
0.264
0.256
0.248


X330


X370


X340


X390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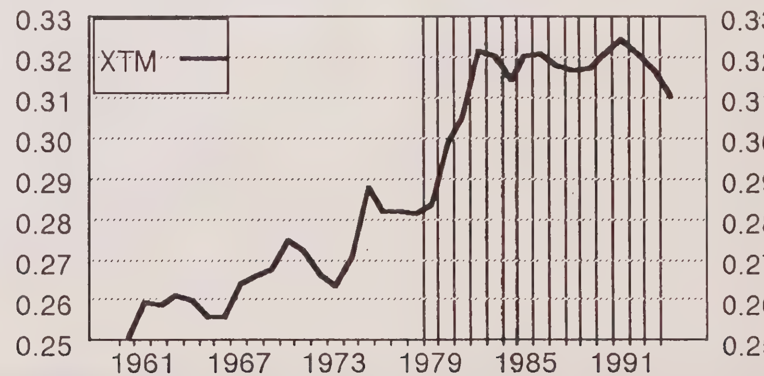
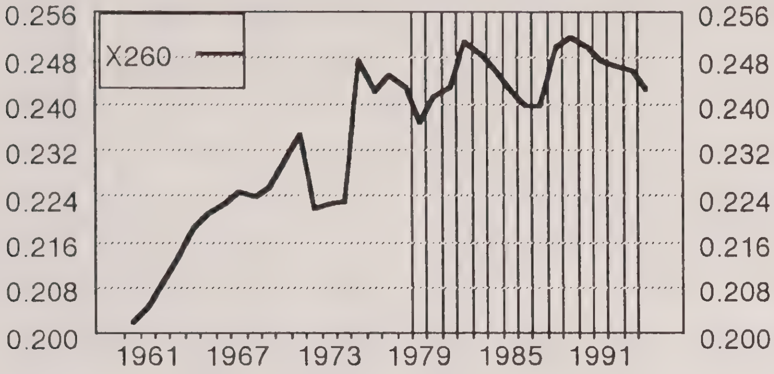

XTM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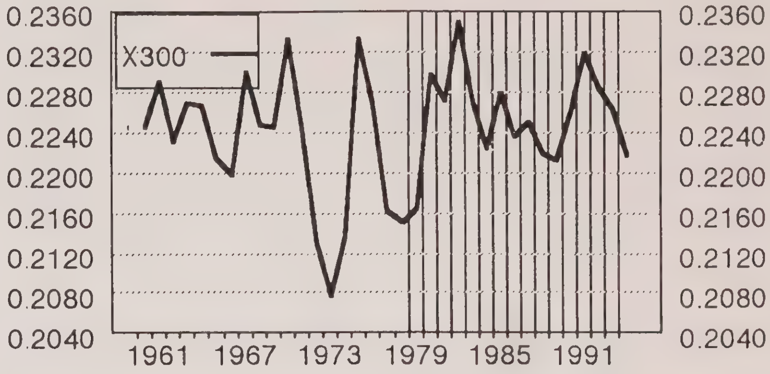
0.240
0.232
0.224
0.216
0.208
0.200
1961 1967 1973 1979 1985 1991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0.2200
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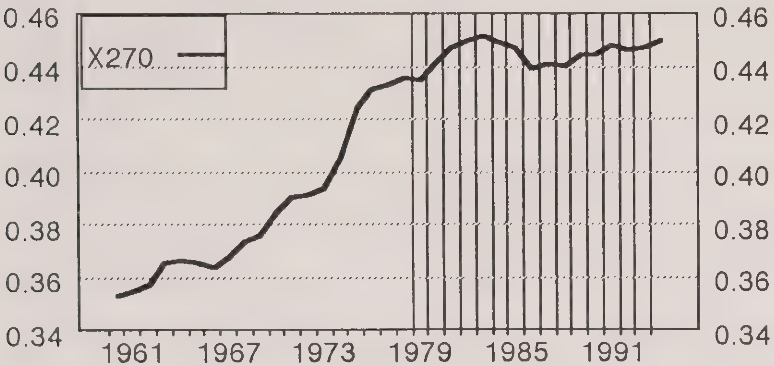
0.2080
0.2040
1961 1967 1973 1979 1985 1991


X270
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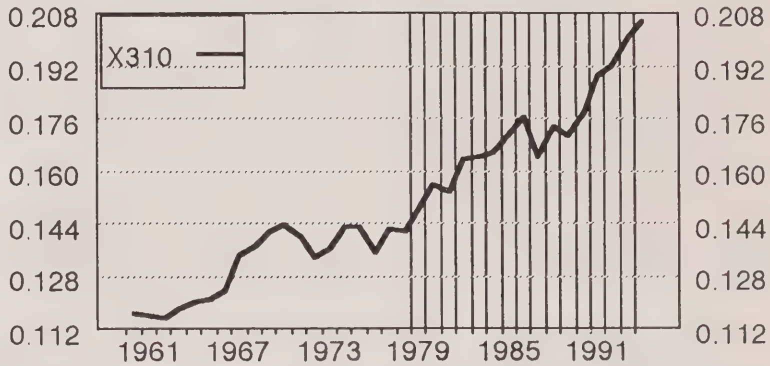
0.34
1961 1967 1973 1979 1985 1991


X310
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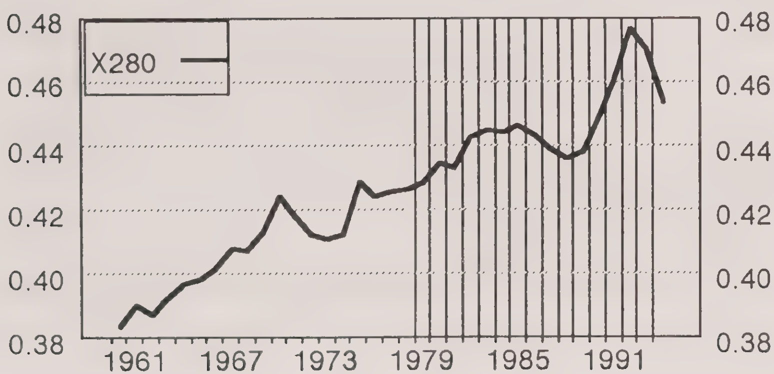
1961 1967 1973 1979 1985 1991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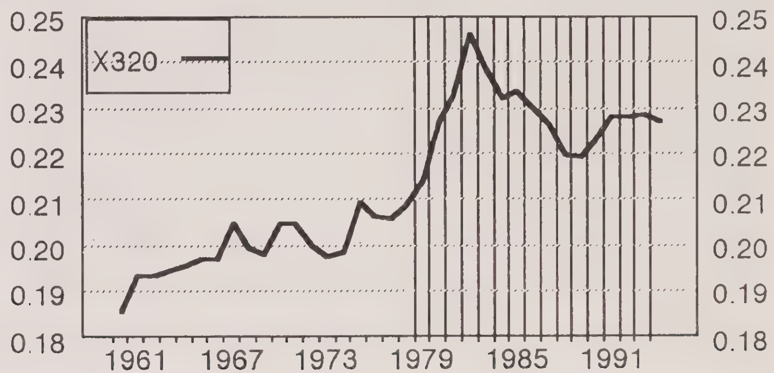
0.40
0.38
1961 1967 1973 1979 1985 1991


X320
0.25
0.24
0.23
0.22
0.21
0.20
0.19
0.18
1961 1967 1973 1979 1985 1991

Percent of Non Production Employees

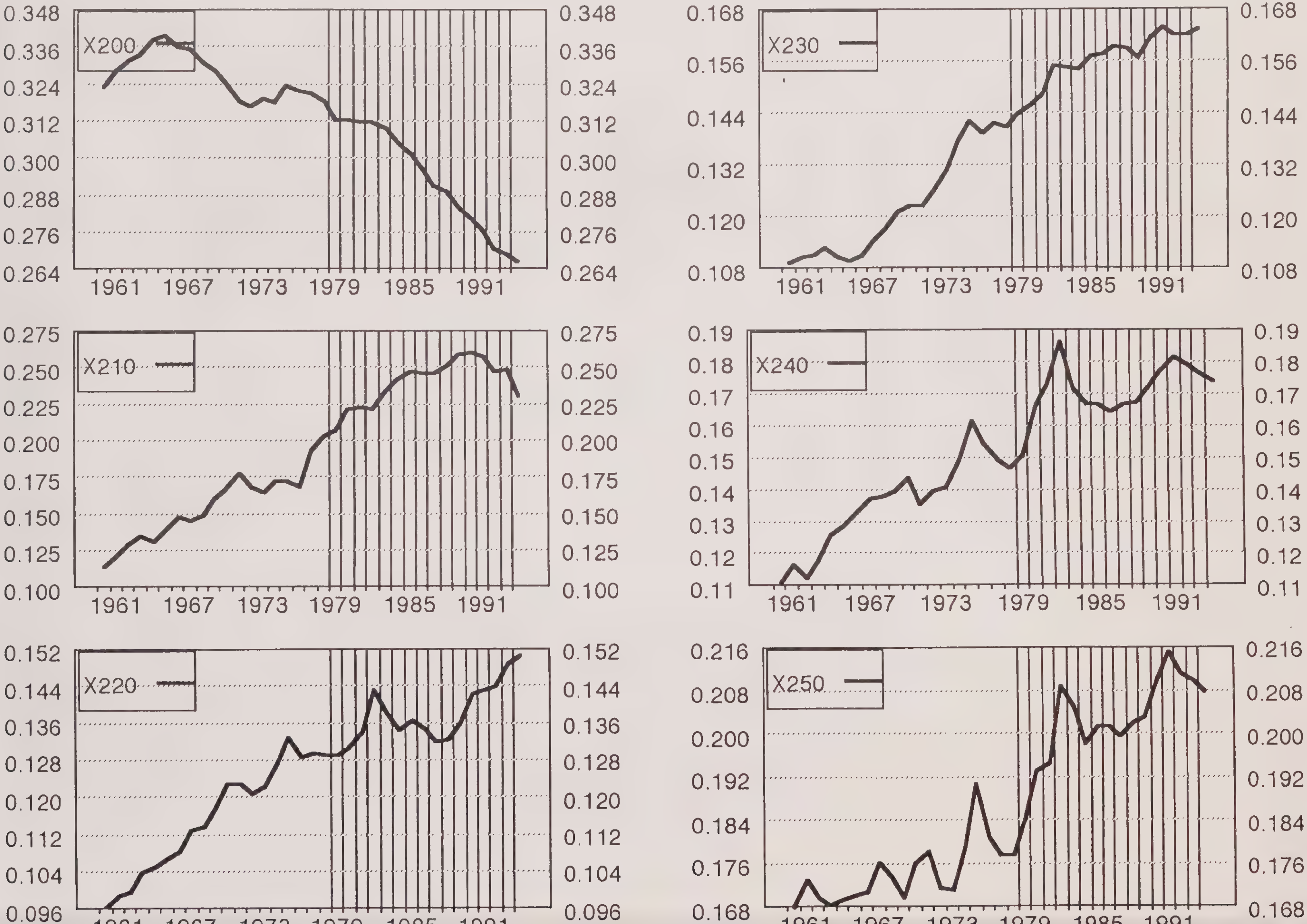


Table 5: Howell and Wolff (1992)

Table 1. *Skill change: highest and lowest ranking industries, 1970–1985*

	Cognitive skills			Interactive skills			Motor skills	
	Change 1970–1985	Level 1985		Change 1970–1985	Level 1985		Change 1970–1985	Level 1985
Highest:								
1 Radio/TV	0·749	6·63	Coal mining	1·449	2·63	Auto repair	0·129	6·27
2 Bus/personal serv.	0·623	4·01	Metal mining	0·955	2·38	Amusements	0·122	5·08
3 Telecommunications	0·493	4·62	Petrol mining	0·735	2·61	Log/wood	0·094	5·14
4 Amusement	0·464	4·71	Non met. mining	0·569	2·15	Tobacco	0·071	5·22
5 Machinery	0·358	4·40	Retail	0·261	2·34	Food processing	0·060	5·10
6 Utilities	0·336	4·28	Bus/pers	0·248	1·96	Education	0·052	4·14
7 Tobacco	0·280	3·34	Insurance	0·215	3·23	Radio/TV	0·050	5·63
8 Health	0·276	4·67	Tobacco	0·180	1·43	Wholesale	0·015	4·54
9 Textile	0·239	2·86	Construction	0·175	1·56	Textile	0·007	4·54
10 Instruments	0·201	4·31	Banking	0·159	1·61	Retail	0·000	4·62
Lowest:								
34 Fab. metals	0·028	3·86	Apparel	−0·051	2·65	Apparel	−0·162	4·42
35 Food processing	0·017	3·09	Fab. metals	−0·060	1·37	Machinery	−0·172	5·59
36 Metal mining	−0·001	3·75	Auto repair	−0·089	1·68	Petrol refining	−0·175	5·30
37 Hotels	−0·027	2·95	Agriculture	−0·109	1·63	Non met. mining	−0·186	4·98
38 Furniture	−0·049	3·26	Hotels	−0·134	1·86	Construction	−0·232	5·94
39 Petrol mining	−0·131	4·41	Prof. services	−0·166	3·99	Telecommunications	−0·249	5·64
40 Coal mining	−0·148	3·12	Food processing	−0·169	1·43	Banking	−0·290	4·95
41 Petrol refining	−0·163	4·42	Radio/TV	−0·174	2·76	Petrol mining	−0·474	4·96
42 Education	−0·206	5·20	Education	−0·361	4·83	Metal mining	−0·523	5·10
43 Agriculture	−0·208	3·42	Chemicals	−0·768	1·15	Coal mining	−0·813	4·66
Industry mean	0·135	4·08		0·109	1·99		−0·101	5·24

Table 6:
AVERAGE RATES OF GROWTH,
RATIO OF NONWAGE BENEFITS TO
EMPLOYMENT FOR PRE (1968-78) AND POST (1979-94):

	PRE	Post	% Change
TM	0.107	0.059	-4.8 %
DM	0.107	0.060	
NDM	0.106	0.057	
20	0.107	0.052	-5.5
21	0.144	0.064	-8.0
22	0.103	0.062	
23	0.092	0.067	
24	0.000	0.000	
25	0.104	0.064	
26	0.116	0.055	-6.1
27	0.102	0.065	
28	0.107	0.065	
29	0.110	0.026	-8.4
30	0.086	0.051	
31	0.097	0.064	
32	0.111	0.049	
33	0.111	0.044	-6.7
34	0.108	0.055	
35	0.104	0.062	
36	0.113	0.055	-5.8
37	0.101	0.067	
38	0.097	0.102	
39	0.102	0.065	

Table 7 A Nonwage Benefits to Employment Ratios, by industry 1968-94, BEA

	TM	DM	Lumb. (24)	Furn. (25)	Stone, Glass, and Clay (32)	Prim. Metals (33)	Fabr. Metals (34)	Mach. (35)	Transp. (37)	Misc. (39)
1968	0.98	1.09	0.65	0.63	0.99	1.48	0.97	1.02		0.63
1969	1.09	1.21	0.74	0.69	1.11	1.62	1.09	1.16	1.76	0.69
1970	1.17	1.31	0.84	0.72	1.21	1.74	1.21	1.26	1.91	0.76
1971	1.32	1.50	0.95	0.78	1.34	1.94	1.35	1.40	2.35	0.85
1972	1.48	1.69	1.03	0.88	1.50	2.26	1.55	1.61	2.62	0.95
1973	1.69	1.91	1.20	1.00	1.71	2.61	1.76	1.81	2.87	1.09
1974	1.93	2.16	1.36	1.14	2.02	3.03	2.05	1.98	3.16	1.23
1975	2.23	2.51	1.56	1.27	2.31	3.76	2.33	2.31	3.58	1.40
1976	2.57	2.90	1.84	1.50	2.64	4.18	2.62	2.73	4.20	1.58
1977	2.94	3.30	2.20	1.80	3.05	4.65	2.96	3.02	5.11	1.72
1978	3.18	3.52	2.46	1.96	3.33	5.01	3.17	3.21	5.31	1.93
1979	3.49	3.83	2.64	2.11	3.69	5.42	3.52	3.54	5.65	2.18
1980	3.93	4.32	2.92	2.41	4.18	6.30	3.96	3.94	6.57	2.46
1981	4.40	4.81	3.18	2.67	4.69	7.12	4.41	4.46	7.06	2.80
1982	4.88	5.38	3.39	2.83	5.04	8.25	4.86	5.11	8.12	3.19
1983	5.11	5.65	3.62	3.14	5.26	8.14	5.14	5.39	8.59	3.46
1984	5.19	5.66	3.81	3.38	5.39	7.44	5.13	5.32	8.54	3.68
1985	5.36	5.81	4.03	3.55	5.52	6.93	5.19	5.39	8.79	3.97
1986	5.61	6.11	4.33	3.82	5.79	7.18	5.53	5.47	9.26	4.16
1987	5.90	6.49	4.31	4.05	6.22	8.49	5.93	6.73	8.62	4.24
1988	6.21	6.89	4.77	4.23	6.14	9.32	6.45	6.52	9.72	4.68
1989	6.45	7.07	4.99	4.41	6.46	8.87	6.45	7.01	9.38	4.99
1990	6.73	7.29	5.02	4.79	6.79	8.93	6.84	6.96	9.84	5.25
1991	7.24	7.86	5.35	4.87	6.90	8.84	7.32	7.52	10.55	5.59
1992	7.93	8.73	5.73	5.29	7.47	10.10	7.93	8.62	12.19	5.72
1993	8.48	9.49	6.05	5.75	7.95	10.58	8.40	9.41	14.19	6.07
1994	8.92	10.03	6.02	5.85	8.10	10.99	8.55	9.62	16.44	6.18

Table 7B

	NDM	Food (20)	Tobbaco (21)	Textile (22)	Apprl (23)	Paper (26)	Publsh (27)	Chem (28)	Rubber (30)
1968	0.83	0.86	1.22	0.55	0.48	0.90	0.71	1.16	1.06
1969	0.92	0.95	1.31	0.59	0.53	1.03	0.79	1.27	1.16
1970	0.99	1.03	1.47	0.62	0.56	1.13	0.83	1.38	1.23
1971	1.08	1.13	1.69	0.69	0.61	1.28	0.92	1.52	1.33
1972	1.20	1.26	1.87	0.76	0.66	1.48	1.03	1.69	1.47
1973	1.38	1.46	2.28	0.90	0.75	1.69	1.24	1.93	1.62
1974	1.61	1.66	2.70	1.01	0.83	1.91	1.37	2.27	1.82
1975	1.85	1.89	3.14	1.08	0.91	2.25	1.54	2.68	2.03
1976	2.12	2.18	3.69	1.27	1.04	2.61	1.74	3.08	2.31
1977	2.43	2.55	4.50	1.48	1.20	2.92	2.01	3.50	2.53
1978	2.68	2.79	5.96	1.69	1.34	3.24	2.17	3.75	2.72
1979	2.98	3.10	6.05	1.85	1.41	3.60	2.35	4.27	2.97
1980	3.34	3.48	6.46	2.04	1.58	4.04	2.64	4.75	3.37
1981	3.79	3.93	7.88	2.33	1.80	4.52	3.00	5.42	3.72
1982	4.18	4.29	8.62	2.45	1.94	5.06	3.29	5.97	4.05
1983	4.37	4.42	8.63	2.60	2.19	5.23	3.62	6.41	4.19
1984	4.52	4.55	9.19	2.74	2.38	5.34	3.88	6.77	4.11
1985	4.68	4.66	9.25	2.88	2.58	5.41	4.08	7.10	4.10
1986	4.89	4.88	10.08	3.04	2.78	5.81	4.31	7.41	4.33
1987	5.06	5.14	10.92	3.30	2.85	5.96	4.51	7.46	4.64
1988	5.23	5.18	10.06	3.54	2.91	6.09	4.82	8.01	4.92
1989	5.58	5.43	12.32	3.79	3.12	6.64	5.14	8.38	5.38
1990	5.96	5.84	12.85	4.06	3.26	6.87	5.44	9.08	5.59
1991	6.42	6.34	13.77	4.30	3.49	7.28	5.79	9.94	5.98
1992	6.88	6.57	14.49	4.57	3.74	7.95	6.29	10.83	6.38
1993	7.16	6.81	15.82	4.75	3.88	8.31	6.46	11.43	6.65
1994	7.45	7.07	16.91	4.94	4.08	8.66	6.69	12.12	6.69

table 8

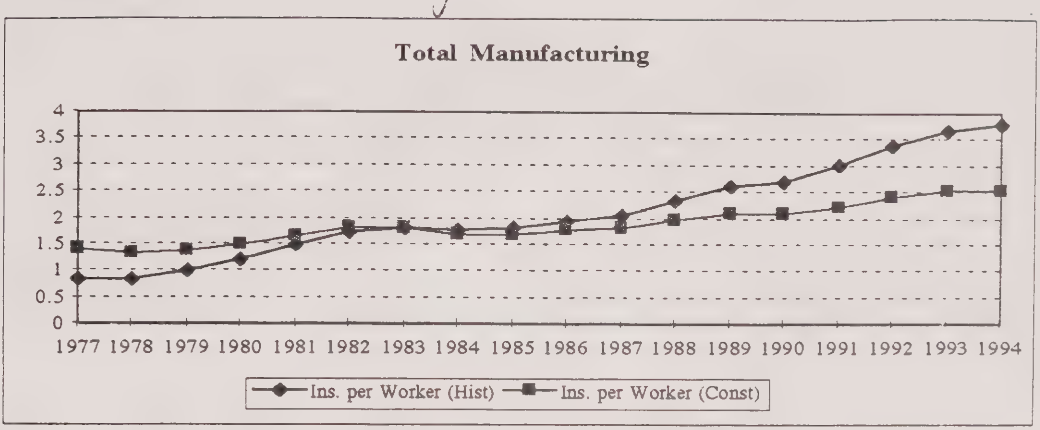
Table :
RATIOS OF INSURANCE BENEFITS TO EMPOYMENT
(units are thousands of dollars per employee)

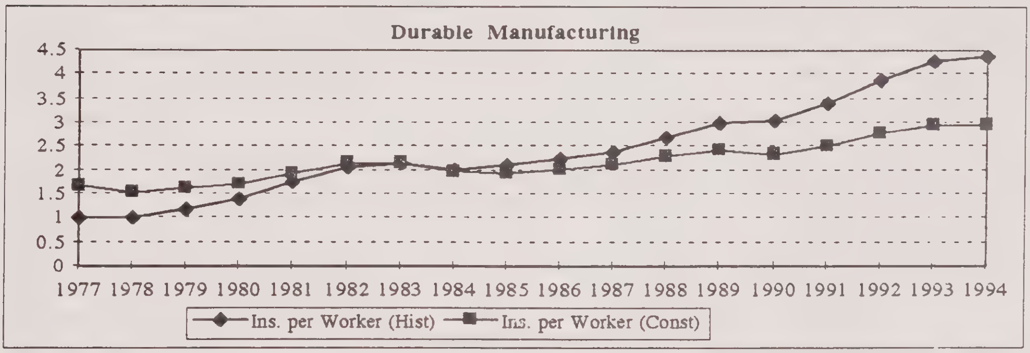
	TM	DM	NDM
1977	0.85	1.01	0.63
1978	0.87	1.00	0.66
1979	1.00	1.17	0.75
1980	1.22	1.43	0.89
1981	1.50	1.75	1.13
1982	1.74	2.07	1.27
1983	1.81	2.16	1.33
1984	1.76	2.04	1.36
1985	1.83	2.10	1.44
1986	1.93	2.23	1.51
1987	2.07	2.40	1.59
1988	2.33	2.70	1.80
1989	2.62	2.99	2.10
1990	2.72	3.04	2.28
1991	3.02	3.41	2.49
1992	3.38	3.87	2.73
1993	3.68	4.27	2.92
1994	3.80	4.35	3.07

	TM		DM		NDM	
	Hist	Const	Hist	Const	Hist	Const
1978	0.014	-0.058	-0.009	-0.079	0.054	-0.021
1979	0.159	0.042	0.165	0.048	0.132	0.018
1980	0.212	0.067	0.223	0.078	0.194	0.052
1981	0.236	0.120	0.223	0.109	0.267	0.149
1982	0.159	0.092	0.184	0.116	0.124	0.059
1983	0.040	0.008	0.040	0.008	0.049	0.016
1984	-0.027	-0.067	-0.054	-0.093	0.018	-0.024
1985	0.040	0.004	0.027	-0.008	0.064	0.028
1986	0.055	0.036	0.063	0.043	0.044	0.025
1987	0.068	0.030	0.075	0.037	0.058	0.021
1988	0.128	0.084	0.127	0.083	0.130	0.085
1989	0.125	0.073	0.108	0.057	0.163	0.110
1990	0.038	-0.015	0.016	-0.036	0.089	0.033
1991	0.110	0.065	0.124	0.078	0.093	0.048
1992	0.119	0.086	0.134	0.101	0.096	0.064
1993	0.089	0.058	0.102	0.071	0.068	0.037
1994	0.032	0.006	0.020	-0.006	0.052	0.025

changes per worker based on historical and constant dollar measures.

Figure 9


Total Manufacturing
4
3.5
3
2.5
2
1.5
1
0.5
0
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994
Ins. per Worker (Hist)
Ins. per Worker (Const)


Durable Manufacturing
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994
Ins. per Worker (Hist)
Ins. per Worker (Const)

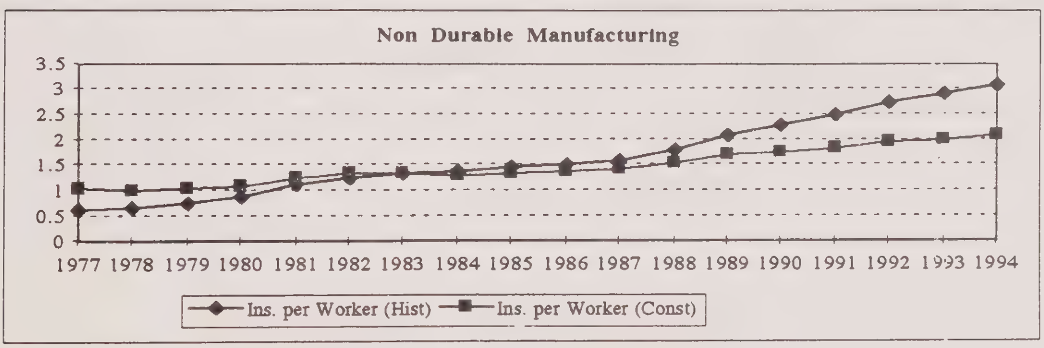

Non Durable Manufacturing
3.5
3
2.5
2
1.5
1
0.5
0
1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994
Ins. per Worker (Hist)
Ins. per Worker (Const)

TABLE 9:
EMPLOYER PROVIDED HEALTH INSURANCE COVERAGE RATES:
Post-1979 Period Trend[1]

	Health Insurance 1980-93				Pension 1979-93		
Year	Employer Pays All	Employer Pays Some	Employer Pays None	Not Provided	Employer Pays	Employer Does Not Pay	Not Provided
All Education Levels							
1980(79)	27.8	32.5	3.0	36.8	46.0	8.0	46.1
1993	16.7	36.7	2.8	43.8	43.7	11.7	44.1
%Change	-11.1	+4.2	-0.2	+7.0	-2.3	+3.7	-2.0
High School Education							
1980(79)	30.1	33.6	2.9	33.4	48.3	7.5	44.2
1993	20.7	33.1	3.0	44.6	41.6	11.2	47.3
%Change	-9.4	-0.5	+0.1	+11.2	-6.7	+3.7	+3.1
DurableGoods Mfg.		% Incl. in Health Plan		% Incl. in Pension			
1979		90.8		74.0			
1988		87.4		67.1			
%Change		-3.4		-6.9			
Non-DurableGoods Mfg.		% Incl. in Health Plan		% Incl. in Pension			
1979		85.1		66.9			
1988		84.1		61.9			
%Change		-1.0		-5.0			

[1] From Houseman's (1995:s113-14) tabulations using Current Population Survey, March 1980 and 1994 data, and Woodbury and Bettinger's (1991) analysis of Current Population Survey, May 1979 and 1988 data.

TABLE 10:
EMPLOYEE BENEFIT EXPENSE AS PERCENT OF PAYROLL,
BY TYPE OF BENEFIT, SELECTED YEARS

US Chamber of Commerce, Annual Survey,1959, 1980, 1992 Manufacturing							
Date	Legally Required Employer Contributions	Insurance, Pension and Other Agreed-Upon	Payment for Break Times	Payment for Time Not at Work (Vac., Sick and Holidays)	Profit-Sharing, Bonuses, Misc. Benefits	Total	Growth Rate
1959	4.5	6.1	2.7	6.7	1.6	21.6	
1980	9.9	13.0	3.6	9.5	2.2	38.2	+77.0%
1992	9.2	16.7	2.5	10.8	2.1	41.2	+ 7.9%
BLS Survey of Establishments, Supplements to Compensation, All Industries							
1966		4.9					
1976		9.2					+87.7%
1987		10.6					+15.2%

[a] Data are from Woodbury (1983: 167) and Nathan (1987:8).

Table [illegible]: Chamber of Commerce Surveys of Employee Benefits by Major Type, Industry Variations, Selected Years

SIC	INDUSTRY	Total, Percent of Payroll	Change 1978-1992	Change 1959-1978	Legally Required Payments	Retirement/ Savings plans	Medical and Life Insurance	Payment for Time Not Worked
Total manufacturing		41.2%	+3.8	+13.4	9.2%	6.8%	10.9%	10.8%
200	FOOD	45.2	+10.2	+13.2	8.5	12.1	10.8	9.8
210	TOBACCO							
220	TEXTILES	30.4	+1.6	+8.8	10.5	1.7	9.7	6.9
230	APPAREL							
240	LUMBER	38.4	+4.0	+15.6	11.0	2.6	11.4	11.6
250	FURNITURE							
260	PAPER							
270	PRINTING	40.5	+6.2	+14.4	9.5	6.7	9.3	10.2
280	CHEMICALS	40.8	-2.6	+18.4	9.1	6.8	10.4	8.6
290	PETROLEUM	40.8	-1.5	+14.0	8.1	6.9	9.5	15.0
300	RUBBER	50.4	+17.8	+10.0	11.4	6.5	18.6	10.3
310	LEATHER							
320	STONE/CLAY/ GLASS	37.3	-0.4	+16.3	11.8	3.1	11.8	9.5
330	PRIM METALS	42.7	+1.1	+19.2	11.3	6.2	14.0	7.1
340	FABRIC METALS	45.9	+7.2	+14.1	9.5	7.5	12.0	12.4
350	MACHINERY	41.0	+2.6	+17.5	7.7	10.2	7.1	11.8
360	ELECTRICAL MACH	40.7	+3.6	+15.6	9.2	8.2	12.2	9.3
370	TRANSP EQPMT	44.3	+3.8	+19.2	9.1	4.7	13.7	13.5
380	INSTRUMENTS	32.3	-4.1	+13.7	9.5	3.9	7.4	7.3
390	MISC MFG							

Table 12 A: Unionization rates:

Table 9. Comparison of Douty and Freeman-Medoff Estimates of the Extent of Unionization of Production Workers in U.S. Manufacturing Industries.

	Extent of Collective Bargaining Coverage (percent)		*Extent of Union Membership (percent)*
Industry Groups (SIC Number)	*Douty (1958)*	*Freeman-Medoff (1968-72)*	*Freeman-Medoff (1973-75)*
All Manufacturing	67	61	49
Ordnance & Accessories (19)	84	79	64
Food & Kindred Products (20)	68	65	52
Tobacco Manufactures (21)	63	76	42
Textile Mill Products (22)	30	26	17
Apparel & Other Finished Textile Products (23)	60	53	36
Lumber & Wood Products (24)	44	35	30
Furniture & Fixtures (25)	49	49	29
Paper & Allied Products (26)	76	72	67
Printing, Publishing, & Allied Industries (27)	65	49	38
Chemicals & Allied Products (28)	65	68	46
Products of Petroleum & Coal (29)	89	74	59
Rubber Products (30)	81	56	51
Leather & Leather Products (31)	49	57	34
Stone, Clay, & Glass Products (32)	78	78	62
Primary Metal Industries (33)	89	88	73
Fabricated Metal Industries (34)	71	56	51
Machinery, Except Electrical (35)	68	57	46
Electrical Machinery (36)	73	58	46
Transportation Equipment (37)	87	87	71
Instruments & Related Products (38)	52	44	33
Miscellaneous Manufacturing Industries (39)	54	52	34

Table 12 B

Table 4. Three-Year Moving Averages of the Percentage Unionized, by Major Industry, 1973–81.†

Industry (Inclusive Census Industry Codes)	*1974*		*1975*		*1976*		*1977*		*1978*		*1979*		*1980*	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Agriculture, Forestry, and Fisheries (017–028)	739	8.2	736	6.5	832	6.5	945	7.2	1,029	8.0	1,249	8.2	984	7.6
Mining (047–057)	1,204	37.2	1,222	35.0	1,458	35.1	1,625	35.7	1,825	36.3	2,105	34.9	1,688	33.3
Construction (067–077)	8,700	38.3	7,974	37.4	8,517	37.5	8,878	36.0	9,754	35.3	9,982	34.0	7,612	34.2
Manufacturing:														
Durable Goods (107–259)	22,609	39.9	21,592	42.0	21,833	41.1	21,884	40.2	22,829	39.8	23,252	38.6	17,790	38.6
Nondurable Goods (268–398)	15,510	35.1	14,745	33.6	15,297	32.7	15,463	31.8	15,910	32.3	16,011	32.0	12,208	31.8
Total Manufacturing	38,119	37.9	36,337	38.6	37,130	37.7	37,347	36.8	38,739	36.8	39,463	36.0	29,998	35.9

table 12c

[illegible]	Electrical Machinery, Equipment	2,411	33.1	2,347	32.8	2,391	30.8	2,446	29.6	2,602	28.2	2,715	26.7	2,087	25.7
209	Not Specified Electrical Machinery	26	18.0	18	0.0	16	0.0	15	0.0	12	0.0	16	11.3	13	13.9
219	Motor Vehicles and Motor Vehicle Equip.	2,060	71.9	1,909	71.8	1,923	72.0	1,985	71.2	2,150	69.3	2,035	67.1	1,505	66.0
227	Aircraft and Parts	1,007	41.6	950	41.0	896	38.7	862	37.0	905	39.8	1,053	42.6	851	43.5
228	Ship and Boat Building and Repairing	471	43.3	485	43.9	565	45.1	571	45.4	558	42.4	542	40.5	408	38.0
229	Railroad Locomotives and Equipment	101	76.6	99	75.8	101	72.2	89	60.7	99	65.7	114	68.6	93	75.4
237	Mobile Dwellings and Campers	168	17.7	134	18.1	140	14.5	138	11.0	128	11.1	97	9.3	68	16.0
238	Cycles and Miscellaneous Transport	90	46.5	70	46.0	60	43.7	44	38.9	40	34.9	41	39.1	35	32.7
239	Scientific and Controlling Instrum.	280	33.4	286	28.8	277	28.3	284	29.9	302	27.4	323	22.1	250	19.8
247	Optical and Health Services Supplies	307	17.2	317	16.8	377	15.7	406	15.7	416	15.5	434	14.4	335	13.3
248	Photographic Equipment and Supplies	205	14.2	194	13.9	206	16.0	205	12.2	227	14.1	223	10.7	184	9.8
249	Watches, Clocks, and Clockwork	43	37.2	41	37.8	42	33.4	47	25.9	66	24.1	73	32.1	56	34.8
257	Not Specified Professional Equipment	0	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0
258	Ordnance	391	40.6	364	36.9	358	36.1	339	35.4	350	30.6	394	29.0	323	30.3
259	Miscellaneous Manufacturing Indust.	982	28.5	952	26.3	963	25.9	951	24.1	964	22.1	974	21.0	730	18.8
MANUFACTURING: NONDURABLE GOODS															
268	Meat Products	615	46.5	593	45.6	676	44.3	735	42.9	786	44.6	782	44.9	595	46.1
269	Dairy Products	355	44.4	343	42.9	365	41.1	387	38.3	398	39.3	388	37.5	281	36.4
278	Canning and Preserving Fruits, Veg.	563	47.7	484	46.9	541	45.1	546	42.2	591	44.8	543	42.2	403	43.3
279	Grain-Mill Products	228	40.0	208	39.5	231	35.3	240	33.5	259	34.1	265	30.3	205	28.0
287	Baker Products	478	55.3	489	57.5	500	57.4	484	54.3	442	50.5	441	50.1	334	50.1
288	Confectionery and Related Products	146	37.7	124	42.3	132	47.8	147	42.6	169	41.6	152	39.6	97	40.8

table 120

Table 3, Continued.

Census Industry Classification	Industry	1974 #	1974 %	1975 #	1975 %	1976 #	1976 %	1977 #	1977 %	1978 #	1978 %	1979 #	1979 %	1980 #	1980 %
289	Beverage Industries	423	46.0	396	42.5	405	43.1	402	41.5	412	42.0	405	41.1	313	43.5
297	Miscellaneous Food Preparation	296	33.0	276	37.1	309	41.8	343	46.2	376	45.8	379	46.0	278	47.6
298	Not Specified Food Industries	3	0.0	0	0.0	4	22.6	5	17.4	5	17.4	4	5.0	3	10.0
299	Tobacco Manufacturers	143	34.1	125	39.1	121	31.9	109	31.7	103	29.1	98	32.9	75	39.9
307	Knitting Mills	428	15.5	415	14.5	396	11.8	359	12.6	328	13.0	301	15.9	238	15.5
308	Dyeing and Finishing Textiles	101	32.9	98	28.1	99	32.3	99	28.0	104	29.1	100	29.5	72	30.3
309	Floor Covering, except Hard Surface	77	17.0	83	15.3	93	12.9	88	12.4	83	8.5	83	7.8	61	6.6
317	Yarn, Thread, and Fabric Mills	945	11.8	856	10.9	906	8.1	931	7.2	902	7.2	832	9.2	616	10.4
318	Miscellaneous Textile Mill Products	112	39.5	118	34.8	116	37.7	110	27.7	104	24.8	103	21.5	72	23.0
319	Apparel and Accessories	2,293	36.2	2,118	33.7	2,135	31.8	2,100	30.0	2,179	30.7	2,198	29.7	1,663	29.1
327	Miscellaneous Fabricated Textiles	313	29.5	285	28.0	302	24.2	312	21.3	307	23.9	277	24.2	202	27.7
328	Pulp, Paper, and Paperboard Mills	532	68.7	506	67.6	502	66.7	534	67.3	589	68.1	632	69.1	490	67.1
329	Miscellaneous Paper and Pulp Products	396	47.5	287	43.9	396	45.2	395	40.5	393	42.9	395	42.7	287	42.1
337	Paperboard Containers and boxes	402	49.2	353	49.2	351	53.4	354	54.5	350	55.2	351	53.3	286	52.9
338	Newspaper Publishing and Printing	941	19.2	930	17.8	1,071	17.4	1,142	17.6	1,137	20.0	1,133	19.7	840	19.2
339	Printing, Publishing, and Allied Fld.	1,536	24.7	1,498	23.4	1,449	22.2	1,399	21.0	1,497	21.1	1,648	21.4	1,346	21.6
347	Industrial Chemicals	629	34.5	604	35.2	682	34.8	743	33.7	851	34.8	902	36.6	698	37.4
348	Plastics, Synthetics and Resins	192	37.7	180	36.3	171	35.6	153	36.1	138	34.3	141	29.2	111	26.6
349	Synthetic Fibers	172	26.8	179	31.9	177	30.7	180	32.9	177	28.3	186	34.3	134	31.5
357	Drugs and Medicines	322	22.5	335	17.8	337	16.0	310	15.2	303	17.0	318	15.9	255	16.3
358	Soaps and Cosmetics	208	27.1	199	33.4	222	37.2	231	35.6	239	30.7	242	22.9	189	24.8
359	Paints, Varnishes, and Related Prod.	147	29.8	125	32.9	110	32.2	96	32.5	99	29.5	109	32.6	90	32.2

table 12E

Table 4. (Continued)

CPS Code	Industry	1983-1985 N	MEM	COV	1986 N	MEM	COV	1987 N	MEM	COV	1988 N	MEM	COV
332	Not Specified Machinery	2	0.0	0.0	6	33.1	33.1	3	0.0	0.0	6	18.3	45.4
340	Household Appliances	94	35.7	38.9	303	39.3	42.9	298	38.7	40.8	267	39.6	43.1
341	Radio, T.V., and Communication Equipment	385	22.5	24.5	867	17.6	19.4	873	17.6	19.6	763	14.8	16.5
342	Electrical Machinery, Equipment, and Supplies, n.e.c.	972	25.3	26.8	2529	16.4	18.1	2482	17.3	18.6	2222	14.8	16.5
350	Not Specified Electrical Machinery, Equipment, and Supplies	6	17.5	17.5	14	0.0	0.0	12	13.0	13.0	12	10.6	10.6
351	Motor Vehicles and Motor Vehicle Equipment	739	56.6	58.2	2157	55.4	57.0	2029	54.3	55.9	1996	54.6	56.2
352	Aircraft and Parts	374	38.1	41.0	1057	37.3	43.0	1054	34.3	38.8	893	32.2	37.4
360	Ship and Boat Building and Repairing	265	42.0	47.2	519	30.0	34.4	475	26.6	29.9	466	27.0	30.7
361	Railroad Locomotives and Equipment	10	70.5	70.5	38	42.1	42.1	39	42.6	46.1	30	35.8	35.8
362	Guided Missiles, Space Vehicles, and Parts	203	16.8	20.0	617	16.9	21.6	653	17.4	21.4	543	18.7	21.7
370	Cycles and Miscellaneous Transportation Equipment	46	16.4	16.4	100	22.0	24.4	97	29.1	30.1	94	24.7	24.7
371	Scientific and Controlling Instruments	105	15.1	16.5	452	12.6	14.1	423	12.6	13.5	388	10.8	11.0
372	Optical and Health Services Supplies	209	10.5	11.6	532	8.7	9.8	543	7.5	8.7	485	5.7	6.4
380	Photographic Equipment and Supplies	89	7.9	9.0	250	9.2	10.0	214	6.7	7.0	190	3.9	4.7
381	Watches, Clocks, and Clockwork Operated Devices	13	19.6	19.6	29	15.2	15.2	39	8.3	8.3	28	14.4	15.8
382	Not Specified Professional Equipment	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	1	0.0	0.0
390	Toys, Amusement, and Sporting Goods	98	24.6	24.6	203	10.4	11.2	197	13.0	14.2	201	14.7	17.3
391	Miscellaneous Manufacturing Industries	216	13.1	13.1	678	15.0	15.7	635	13.4	14.1	629	8.9	10.4
392	Not Specified Manufacturing Industries	16	0.0	6.7	45	4.5	4.5	59	14.2	18.9	32	6.4	6.4
	Transportation												
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

table 12F

Table 4. (Continued)

CPS Code Industry	1983-1985			1986			1987			1988		
	N	MEM	COV	N	MEM	COV	N	MEM	COV	N	MEM	COV
190 Paints, Varnishes, and Related Products	48	17.6	21.4	104	17.3	18.7	113	18.8	20.5	93	26.5	28.9
191 Agricultural Chemicals	39	15.6	19.0	96	17.0	20.1	89	13.9	14.6	74	16.5	19.8
192 Industrial and Miscellaneous Chemicals	392	26.7	28.4	1027	18.7	22.0	1051	21.8	23.4	1061	18.4	20.1
200 Petroleum Refining	121	39.5	41.5	275	33.3	35.9	253	36.5	38.5	255	34.4	35.4
201 Miscellaneous Petroleum and Coal Products	10	3.5	3.5	29	38.3	38.3	42	10.1	13.2	29	19.1	19.1
210 Tires and Inner Tubes	83	41.6	41.6	156	47.0	48.4	160	47.7	51.9	152	43.5	44.9
211 Other Rubber Products, Plastics Footwear and Belting	105	20.5	20.7	263	22.7	24.2	230	23.0	24.2	287	23.0	24.6
212 Miscellaneous Plastics Products	319	28.9	29.3	792	15.5	16.7	903	16.7	18.2	886	13.9	15.1
220 Leather Tanning and Finishing	9	68.2	68.2	20	44.2	44.2	25	27.8	27.8	21	32.8	32.8
221 Footwear, Exc. Rubber and Plastic	172	23.5	25.6	206	19.3	21.3	210	18.2	21.3	178	17.0	18.9
222 Leather Products, Exc. Footwear	48	15.4	17.7	76	18.2	18.2	64	19.8	19.8	58	12.9	14.0
Manufacturing: Durable Goods												
230 Logging	120	11.3	12.4	188	4.0	4.7	176	4.9	6.8	187	3.9	5.0
231 Sawmills, Planing Mills, and Millwork	288	18.7	19.3	613	16.4	17.7	678	17.3	18.7	676	18.5	19.8
232 Wood Buildings and Mobile Homes	38	12.8	12.8	96	4.8	5.7	129	4.7	5.8	106	5.6	5.6
241 Miscellaneous Wood Products	92	8.3	9.3	212	16.9	18.7	222	13.2	14.5	228	15.2	16.7
242 Furniture and Fixtures	342	22.8	24.8	1155	15.5	17.1	1174	16.8	18.2	1153	17.0	17.9
250 Glass and Glass Products	94	63.2	64.1	310	46.6	48.2	287	46.5	47.5	274	42.0	43.4
251 Cement, Concrete, Gypsum, and Plaster Products	147	30.4	30.4	361	23.0	23.9	344	20.9	23.1	347	20.7	23.2
252 Structural Clay Products	15	18.8	29.2	76	28.2	28.2	55	26.7	32.1	60	20.1	20.1
261 Pottery and Related Products	22	37.4	37.4	60	18.6	18.6	57	24.7	24.7	53	26.0	26.0
262 Miscellaneous Nonmetallic Mineral and Stone Products	98	30.1	30.1	230	23.5	23.5	236	21.7	23.2	208	22.9	25.3
270 Blast Furnaces, Steelworks, Rolling and Finishing Mills	257	64.0	66.0	560	60.4	61.6	572	56.1	56.8	564	56.2	58.5
271 Iron and Steel Foundries	102	44.5	47.8	203	44.5	45.8	193	39.1	40.4	189	37.9	39.9
272 Primary Aluminum Industries	75	39.5	41.4	216	39.6	39.6	252	42.6	42.9	218	41.1	44.9
280 Other Primary Metal Industries	128	30.2	35.7	339	31.7	34.9	356	31.4	33.2	292	28.1	31.0
281 Cutlery, Handtools, and Other Hardware	90	37.8	39.7	222	25.2	26.7	222	23.5	25.7	206	19.5	21.1
282 Fabricated Structural Metal Products	310	25.8	26.9	814	24.3	26.5	807	23.4	25.0	805	20.5	22.2
290 Screw Machine Products	41	12.0	16.7	106	11.0	13.5	101	17.2	20.3	89	12.3	14.1
291 Metal Forgings and Stampings	101	48.3	48.3	246	33.8	36.2	242	39.6	41.4	214	38.4	38.8
292 Ordnance	69	47.5	48.3	199	33.7	39.6	201	33.9	36.6	181	33.4	36.8
300 Miscellaneous Fabricated Metal Products	282	35.0	37.9	631	30.0	31.4	550	27.3	28.2	564	26.2	26.8
301 Not Specified Metal Industries	1	100.0	100.0	4	0.0	0.0	3	0.0	0.0	0	0.0	0.0
310 Engines and Turbines	66	38.7	40.2	162	46.3	47.4	166	51.1	51.6	116	48.9	48.9
311 Farm Machinery and Equipment	122	21.9	24.6	197	23.9	25.5	216	24.5	25.9	223	27.5	29.9
312 Construction and Material Handling Machines	159	28.7	30.9	381	27.2	28.5	336	27.3	27.9	360	25.4	26.8
320 Metalworking Machinery	191	17.8	19.6	499	14.5	15.9	449	12.9	15.0	448	13.1	14.6
321 Office and Accounting Machines	83	8.1	8.1	164	9.4	10.8	134	8.2	8.2	135	7.9	8.0
322 Electronic Computing Equipment	459	6.0	7.1	1255	4.1	4.5	1181	3.0	3.9	1138	2.7	4.0
331 Machinery, Exc. Electrical, n.e.c.	684	25.4	26.1	1716	20.8	21.9	1652	19.6	20.7	1638	19.2	20.6

(Continued)

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1968 AA

TABLE 13.—FULL- OR PART-TIME STATUS OF THE CIVILIAN LABOR FORCE BY 2-DIGIT MANUFACTURING INDUSTR
(WAGE AND SALARY WORKERS)

1968

2-DIGIT MFG. INDUSTRIES	FULL-TIME LABOR FORCE TOTAL	EMPL FULL TIME	PART TIME, ECON	UNEMPL NUMBER	UNEMPL RATE	PART-TIME LABOR FORCE TOTAL	% OF CIV LF	EMPL PART TIME	% OF TOTAL EMPL	UNEMPL NUMBER	UNEMPL RATE	% OF TOTAL UNEMPL
TOTAL												
TOTAL MFG	20595	19362	428	605	2.9	676	3.2	585	2.8	92	13.5	13.1
DURABLE GDS	12286	11803	157	326	2.7	262	2.1	215	1.8	46	17.7	12.4
LUMBER	604	550	27	26	4.4	23	3.7	20	3.4	3	13.4	10.6
FURNITURE	454	429	10	15	3.4	12	2.7	10	2.2	3	22.4	15.5
STONE	636	607	9	20	3.1	13	1.9	10	1.6	3	23.2	12.9
PRI MET	1296	1240	25	32	2.5	17	1.3	13	1.0	4	21.1	10.0
FAB MET	1687	1628	17	42	2.5	39	2.3	35	2.1	5	12.1	10.3
MACHINERY	2165	2108	13	44	2.0	45	2.1	37	1.7	8	18.6	16.1
ELEC EQPT	1986	1911	18	58	2.9	46	2.3	38	1.9	8	16.8	11.8
AUTOMOBILES	1093	1054	15	25	2.3	9	.8	7	.7	2	21.5	7.3
OT TR EQPT	1397	1353	10	34	2.4	13	.9	11	.8	3	19.9	7.2
INSTRUMENTS	501	487	2	12	2.3	11	2.1	9	1.8	2	18.1	14.5
MISC	466	436	11	19	4.0	32	6.5	26	5.5	6	19.7	25.3
NONDUR GDS	8309	7759	271	279	3.4	415	4.8	369	4.4	45	10.9	14.0
FOOD	1762	1618	69	76	4.3	104	5.6	92	5.2	13	12.1	14.2
TOBACCO	84	75	4	4	5.3	2	1.8	1	1.1	1	43.3	13.0
TEXTILES	1062	983	44	35	3.3	26	2.4	23	2.2	3	12.9	8.8
APPAREL	1323	1150	99	74	5.6	70	5.0	61	4.6	9	13.1	11.1
PAPER	764	736	10	18	2.4	12	1.6	10	1.3	2	20.0	11.9
PRINTING	1011	975	14	22	2.2	147	12.7	139	12.3	9	5.8	27.8
CHEMICALS	1172	1147	6	19	1.6	22	1.9	18	1.5	4	19.0	18.1
PETROLEUM	255	250	1	3	1.3	4	1.6	4	1.4	1	14.9	15.6
RUB & PLAS	514	492	8	14	2.7	13	2.5	12	2.3	2	13.3	11.5
LEATHER	362	332	17	13	3.7	13	3.5	11	3.2	2	13.[illegible]	12.1

CPS BASE TABLES --- 12 MONTH AVERAGES DEC79 DATE 122879 P

TABLE 13.--FULL- OR PART-TIME STATUS OF THE CIVILIAN LABOR FORCE BY 2-DIGIT MANUFACTURING INDUSTRIES
(WAGE AND SALARY WORKERS)
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1979 AA

2-DIGIT MFG. INDUSTRIES	FULL-TIME LABOR FORCE TOTAL	EMPL FULL TIME	EMPL PART TIME, ECON	UNEMPL NUMBER	UNEMPL RATE	PART-TIME LABOR FORCE TOTAL	% OF CIV LF	EMPL PART TIME	% OF TOTAL EMPL	UNEMPL NUMBER	UNEMPL RATE	% OF TOTAL UNEMPL
TOTAL												
TOTAL MFG	22174	20545	500	1129	5.1	874	3.8	730	3.4	144	16.5	11.3
DURABLE GDS	13540	12726	190	623	4.6	373	2.7	310	2.3	64	17.0	9.3
ORDNANCE	204	198	1	5	2.3	4	2.1	2	1.2	2	43.8	29.7
LUMBER	657	592	25	40	6.0	29	4.3	26	4.1	3	11.6	8.0
FURNITURE	572	518	20	34	5.9	24	4.1	21	3.8	3	11.8	7.9
STONE,CL,GL	717	663	15	40	5.5	15	2.0	13	1.8	2	12.4	4.3
PRI MET	1291	1226	18	47	3.6	21	1.6	14	1.1	7	34.4	13.5
FAB MET	1519	1409	25	85	5.6	47	3.0	41	2.8	6	13.6	7.0
MACH EX EL	2724	2623	22	80	2.9	71	2.5	63	2.3	7	10.5	8.5
ELEC EQP	2339	2230	15	95	4.0	55	2.3	45	2.0	11	19.2	10.1
TRANS EQP	[illegible]	2235	31	133	5.5	37	1.5	25	1.1	12	32.7	8.2
AUTOS	1318	1208	19	91	6.9	17	1.3	10	.8	8	45.6	8.1
AIRCRAFT	635	623	2	9	1.5	8	1.3	7	1.1	1	14.9	11.5
OT TRANS	446	404	9	32	7.3	11	2.5	9	2.0	3	23.9	7.6
INSTRUMENTS	585	559	4	22	3.7	19	3.2	16	2.7	3	17.2	13.0
MISC	532	472	16	44	8.2	50	8.6	43	8.2	7	13.1	13.1
NONDUR GDS	8634	7818	309	506	5.9	501	5.5	420	4.9	80	16.1	13.7
FOOD	1811	1606	72	134	7.4	101	5.3	82	4.6	19	19.3	12.7
TOBACCO	68	61	1	6	8.6	5	6.3	1	1.8	3	74.9	37.0
TEXTILES	850	762	37	50	5.9	25	2.8	19	2.3	6	23.1	10.1
APPAREL	1324	1101	102	121	9.1	73	5.3	57	4.5	17	22.9	12.2
PAPER	734	701	8	25	3.5	20	2.6	16	2.2	4	20.4	13.7
PRINTING	1306	1213	39	53	4.1	204	13.5	189	13.1	16	7.7	22.7
CHEMICALS	1229	1184	7	39	3.2	28	2.2	24	1.9	5	16.4	10.5
PETROLEUM	258	251	3	5	2.0	2	.9	2	.8	0	13.7	5.8
RUB & PLAS	750	689	16	46	6.1	26	3.3	19	2.7	6	23.6	11.6
LEA&UNSPEC	303	251	26	26	8.7	17	5.4	13	4.4	4	26.0	14.4

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TABLE 15. EMPLOYED AND UNEMPLOYED FULL- AND PART-TIME WAGE AND SALARY WORKERS BY DETAILED INDUSTRY, SEX, AND RACE(cont.)

	EMPLOYED						UNEMPLOYED		
	FULL TIME			PART TIME					
	TOTAL	FULL-TIME SCHEDULES	PART-TIME FOR ECONOMIC REASONS, USUALLY WORK FULL-TIME	TOTAL	VOLUNTARY	PART-TIME FOR ECONOMIC REASONS, USUALLY WORK PART-TIME	TOTAL	LOOKING FOR FULL-TIME WORK	LOOKING FOR PART-TIME WORK
ANNUAL TOTAL									
NONDURABLE GOODS	7811	7630	181	501	361	141	673	611	62
FOOD & KINDRED PRODS. . .	1645	1595	50	91	53	38	174	156	18
TOBACCO MANUFACTURES. . .	50	47	2	2	2	0	4	4	0
TEXTILE MILL PRODS. . . .	627	608	19	22	18	4	46	43	3
APPRL & OTH FIN TEXTLS. .	958	900	57	67	42	25	126	117	9
PAPER & ALLIED PRODS. . .	716	707	9	14	12	2	42	38	4
PRNTNG, PUB, & ALLD IN. .	1487	1464	22	234	180	53	111	95	15
CHEMICALS & ALLIED PRODS.	1257	1250	7	44	35	9	68	63	6
PETROLEUM & COAL PRODS. .	179	178	1	2	2	0	11	9	2
RUBBER & MISC PLASTICS. .	768	759	9	19	13	6	69	64	5
LEATHER & LEATHER PRODS .	126	121	5	7	4	3	22	21	1
SERVICE-PRODUCING INDUSTRIES. .	63264	62310	954	16556	13181	3375	5173	4282	891
TRANS, COMM & OTH PUB UT . .	7283	7202	82	615	447	168	423	387	37
TRANSPORTATION.	4210	4142	69	503	363	140	317	293	24
COMMUN & OTH PUB UTIL . .	3073	3060	13	111	84	28	107	94	12
COMMUNICATIONS.	1501	1493	9	73	56	18	62	55	7
UTIL & SANITARY SVCS. .	1572	1567	4	38	28	10	44	40	5
WHOLESALE & RETAIL TRADE . .	15956	15588	368	6535	5081	1454	2052	1650	402
WHOLESALE TRADE.	4074	4033	41	332	268	65	309	279	30
RETAIL TRADE	11882	11554	328	6203	4814	1389	1743	1371	372
EATING DRINKNG PLCS .	3136	2987	149	2436	1825	611	678	516	162
FINANCE & SERVICE INDUS. . .	34751	34261	490	9060	7362	1698	2520	2092	428
FIN, INS, & REAL EST . . .	6328	6289	39	791	655	136	342	293	49
BANKING & OTH FINANCE. .	2847	2839	8	341	287	54	135	113	22
INS & REAL EST	3481	3450	31	450	368	82	206	179	27

table 14

Table 8. Availability of flexitime on the sole or principal job held by wage and salary workers, May 1985

Characteristic	Total (in thousands)	Percent distribution by availability of flexitime			
		Total	Had flexitime	Did not have flexitime	Didn't know
AGE, SEX, RACE, AND HISPANIC ORIGIN					
Total, 16 years and over	94,280	100.0	13.6	85.6	0.8
16 to 19 years	6,082	100.0	14.8	84.0	1.2
20 to 24 years	13,343	100.0	12.7	86.2	1.1
25 to 54 years	63,363	100.0	13.8	85.4	.8
55 to 64 years	9,536	100.0	11.0	88.1	.9
65 years and over	1,956	100.0	20.6	78.8	.6
Men	51,106	100.0	13.9	85.2	.9
Women	43,173	100.0	13.2	86.0	.8
White	81,699	100.0	14.0	85.2	.8
Men	44,808	100.0	14.4	84.8	.8
Women	36,891	100.0	13.6	85.7	.7
Black	9,991	100.0	9.9	88.5	1.5
Men	4,934	100.0	9.1	89.2	1.7
Women	5,057	100.0	10.7	87.9	1.3
Hispanic origin	6,040	100.0	10.4	88.1	1.5
Men	3,663	100.0	10.4	88.3	1.4
Women	2,376	100.0	10.5	87.9	1.6
INDUSTRY					
Agriculture	1,598	100.0	18.9	80.5	.6
Nonagricultural industries	92,682	100.0	13.5	85.6	.9
Mining	961	100.0	9.5	90.2	.4
Construction	5,353	100.0	9.8	89.5	.6
Manufacturing	20,271	100.0	10.3	88.7	1.0
Durable goods	12,297	100.0	10.7	88.2	1.1
Nondurable goods	7,975	100.0	9.8	89.4	.8
Transportation and public utilities	7,087	100.0	12.8	86.2	1.1
Wholesale trade	3,701	100.0	18.3	80.9	.8
Retail trade	15,663	100.0	13.0	86.1	1.0
Finance, insurance, and real estate	6,096	100.0	20.6	78.7	.7
Services	28,499	100.0	13.9	85.3	.7
Public administration	5,050	100.0	19.0	80.0	1.0
OCCUPATION					
Managerial and professional specialty	22,038	100.0	18.6	80.6	.8
Technical, sales, and administrative support	29,490	100.0	16.5	82.6	.9
Service occupations	13,081	100.0	10.6	88.6	.8
Precision production, craft and repair	11,527	100.0	7.7	91.5	.7
Operators, fabricators, and laborers	16,117	100.0	7.3	91.7	1.0
Farming, forestry, and fishing	2,027	100.0	19.2	79.8	1.0

NOTE: Detail for the above race and Hispanic-origin groups will not sum to totals because data for the "other races" group are not presented and Hispanics are included in both the white and black population groups.

Wage and salary workers as shown in this table exclude incorporated self-employed.

Table 9. Time of day usually worked by employed persons at their sole or principal job, May 1985

Characteristic	Total (in thousands)	Percent distribution by time of day usually worked						
		Total	Day time	Evening shift	Night shift	Rotating shift	Split shift	Other shifts
Total, 16 years and over	106,878	100.0	78.3	9.1	2.9	4.6	1.2	3.9
Wage and salary workers	97,110	100.0	78.3	9.6	3.1	4.8	1.1	3.1
Incorporated self-employed	2,831	100.0	88.2	2.0	.9	1.6	1.4	5.9
All other wage and salary workers	94,280	100.0	78.0	9.8	3.1	4.9	1.0	3.1
Demographic characteristics:								
16 to 19 years	6,082	100.0	38.0	39.2	4.3	9.3	1.3	7.8
20 to 24 years	13,343	100.0	72.8	12.7	3.7	6.4	1.1	3.3
25 to 54 years	63,363	100.0	82.2	7.1	2.9	4.4	1.0	2.4
55 to 64 years	9,536	100.0	83.0	6.3	2.8	3.7	1.2	2.9
65 years and over	1,956	100.0	77.1	6.8	3.6	3.2	1.9	7.4
Men	51,106	100.0	77.7	9.5	3.3	5.3	1.0	3.3
Women	43,173	100.0	78.4	10.3	3.0	4.4	1.1	2.8
White	81,699	100.0	78.3	9.5	3.0	5.0	1.0	3.1
Men	44,808	100.0	78.2	9.0	3.1	5.3	1.0	3.3
Women	36,891	100.0	78.4	10.2	2.9	4.5	1.1	2.9
Black	9,991	100.0	75.7	12.2	3.7	4.7	1.0	2.7
Men	4,934	100.0	73.0	13.2	4.0	5.5	1.0	3.3
Women	5,057	100.0	78.3	11.3	3.4	3.9	1.0	2.1
Hispanic origin	6,040	100.0	79.3	9.8	2.9	3.7	1.1	3.2
Men	3,663	100.0	78.6	9.3	3.1	4.1	1.3	3.6
Women	2,376	100.0	80.5	10.7	2.5	3.1	.8	2.4
Industry:								
Agriculture	1,598	100.0	79.8	6.7	2.4	1.2	4.7	5.2
Nonagricultural industries	92,682	100.0	78.0	9.9	3.2	5.0	1.0	3.0
Mining	961	100.0	77.8	6.5	1.5	11.6	.2	2.6
Construction	5,353	100.0	95.7	1.8	.5	.7	.1	1.3
Manufacturing	20,271	100.0	81.0	9.8	3.4	4.5	.1	1.1
Durable goods	12,297	100.0	83.4	10.3	2.6	2.8	.1	.8
Nondurable goods	7,975	100.0	77.4	9.0	4.6	7.1	.2	1.7
Transportation and public utilities	7,087	100.0	76.8	7.4	4.2	6.1	1.9	3.6
Wholesale trade	3,701	100.0	89.8	3.7	2.3	1.3	.4	2.4
Retail trade	15,663	100.0	59.2	20.3	4.3	10.2	1.5	4.4
Finance, insurance, and real estate	6,096	100.0	90.2	3.7	1.5	1.4	.5	2.7
Services	28,499	100.0	78.7	9.4	3.4	3.5	1.4	3.7
Public administration	5,050	100.0	79.6	5.6	2.0	7.4	1.1	4.3
Occupation:								
Managerial and professional specialty	22,038	100.0	88.3	3.4	1.6	3.0	.8	2.9
Technical, sales, and administrative support	29,490	100.0	80.7	8.7	2.6	4.7	.6	2.7
Service occupations	13,081	100.0	54.3	23.8	6.0	8.1	2.2	5.6
Precision production, craft and repair	11,527	100.0	86.3	6.5	2.3	3.6	.2	1.2
Operators, fabricators, and laborers	16,117	100.0	72.3	12.3	4.7	6.5	1.4	2.8
Farming, forestry, and fishing	2,027	100.0	79.0	7.0	2.0	1.5	3.9	6.5
All other workers[1]	9,768	100.0	77.7	3.8	1.6	2.3	3.1	11.4

[1] Includes the self-employed (unincorporated) and unpaid family workers.

NOTE: Detail for the above race and Hispanic-origin groups will not sum to totals because data for the "other races" group are not presented and Hispanics are included in both the white and black population groups.

jle 4. Availability of a flexible schedule on principal job for wage and salary workers, by usual full time status, industry and x, May 1991
umbers in thousands

Total at work during survey reference week, Both sexes

Industry	All workers					Usual full time on principal job				
	Total	With flexbl. sched.	Without flexbl. sched.	Don't know	No response	Total	With flexbl. sched.	Without flexbl. sched.	Don't know	No response
Total 16+	99,163	15,841	81,232	1,080	1,010	80,452	12,118	66,729	830	775
Private sector	81,421	13,272	66,357	939	854	65,556	10,010	54,189	714	643
Goods-producing industries	25,820	3,201	22,076	313	231	24,057	2,815	20,763	277	202
Agriculture	1,631	263	1,287	47	34	1,285	191	1,030	40	24
Agricultural services	604	69	512	10	13	442	44	379	9	10
Other agriculture	1,027	194	775	38	20	843	148	650	30	14
Mining	668	118	536	13	1	649	115	520	13	1
Construction	4,708	555	4,032	50	71	4,297	445	3,753	43	56
Manufacturing	18,814	2,265	16,220	203	126	17,827	2,064	15,460	182	121
Durable goods	10,936	1,419	9,351	106	60	10,535	1,346	9,028	101	60
Lumber & wood products	618	38	573	6	1	588	34	547	6	1
Furniture & fixtures	518	30	488	–	–	481	27	453	–	–
Stone, clay, & glass products	488	47	431	6	4	457	44	403	6	4
Primary metal industries	711	61	638	10	2	689	59	617	10	2
Fabricated metal products	1,086	78	991	10	7	1,044	69	962	6	7
Machinery except electrical	2,250	400	1,814	20	15	2,180	384	1,761	20	15
Electrical machinery, equipment, & supplies	1,834	303	1,507	19	5	1,770	298	1,450	17	5
Transportation equipment	2,251	304	1,903	23	21	2,226	297	1,885	23	21
Automobiles	1,015	106	892	8	8	1,007	105	887	8	8
Other transportation equipment	1,236	198	1,010	15	13	1,218	192	998	15	13
Professional & photographic equipment	732	110	608	11	3	690	100	576	11	3
Other durable goods industries	446	48	396	2	–	407	34	371	2	–
Nondurable goods	7,877	846	6,869	97	66	7,292	718	6,432	81	62
Food & kindred products	1,666	151	1,480	13	22	1,553	143	1,379	10	22
Textile mill products	614	27	573	7	8	580	23	544	7	8
Apparel & other finished textile products	948	56	875	12	6	886	45	826	10	5
Paper & allied products	691	41	640	9	2	670	41	618	9	2
Printing & publishing	1,576	287	1,258	21	10	1,331	207	1,101	16	7
Chemical & allied products	1,268	188	1,047	28	5	1,222	171	1,021	25	5
Rubber & miscellaneous plastics products	746	62	669	5	10	701	54	634	3	10
Other nondurable goods industries	366	35	327	1	3	348	34	310	1	3
Service producing industries	55,601	10,071	44,281	626	622	41,499	7,196	33,426	437	441

See footnotes at end of table.

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able 4. Shift usually worked on principal job, by industry, sex and usual full ~~par~~t time, May 1991
umbers in thousands-Continued

otal at work during survey reference week, Both sexes, Usual full time

Industry	Total workers	Not reporting shift	Reporting shift	Regular daytime schedule	Shift workers						
					Total	Evening shift	Night shift	Rotating shift	Split shift	Employer-arranged irregular schedule	Other shift
tal 16+	80,452	297	80,156	65,827	14329	4,079	2,951	2,725	502	2,947	1,124
ivate sector	65,556	241	65,315	53,200	12115	3,501	2,484	2,210	406	2,601	914
ods-producing industries	24,057	84	23,974	19,952	4,022	1,399	1,091	818	46	484	185
Agriculture	1,285	10	1,275	1,105	170	14	23	7	18	78	29
Agricultural services	442	4	439	408	31	10	2	2	1	16	-
Other agriculture	843	6	837	698	139	4	22	5	17	62	29
Mining	649	-	649	465	184	21	41	71	1	31	19
Construction	4,297	15	4,282	4,073	209	11	29	16	6	130	17
Manufacturing	17,827	59	17,768	14,309	3,459	1,353	997	724	20	244	120
Durable goods	10,535	34	10,501	8,722	1,779	811	500	305	2	110	51
Lumber & wood products	588	-	588	501	87	25	13	39	-	8	2
Furniture & fixtures	481	2	479	411	68	36	16	2	-	14	-
Stone, clay, & glass products	457	-	457	346	111	26	11	60	-	11	2
Primary metal industries	689	-	689	457	232	64	52	101	-	10	4
Fabricated metal products	1,044	3	1,042	867	175	85	47	21	-	14	8
Machinery exc. electrical	2,180	8	2,173	1,942	231	123	68	18	-	8	13
Electrical machinery, equip., & supplies	1,770	12	1,758	1,462	296	124	115	23	2	25	7
Transportation equip	2,226	10	2,216	1,779	437	259	132	31	-	8	7
Automobiles	1,007	5	1,002	781	222	123	84	10	-	6	0
Other transportation equip	1,218	5	1,214	999	215	137	48	21	-	3	6
Professional & photographic equip	690	-	690	590	100	51	27	6	-	8	8
Other durable goods industries	407	-	407	365	42	18	18	3	-	2	-
Nondurable goods	7,292	26	7,266	5,587	1,680	542	498	418	19	135	68
Food & kindred products	1,553	11	1,542	1,115	427	152	149	56	6	50	14
Textile mill products	580	1	579	404	175	50	73	37	1	8	7
Apparel & other finished textile products	886	-	886	850	37	12	15	2	-	6	3
Paper & allied products	670	-	670	440	230	70	34	112	-	12	2
Printing & publishing	1,331	3	1,328	1,062	266	89	83	40	4	22	28
Chemical & allied products	1,222	8	1,215	974	241	66	45	100	7	14	8
Rubber & miscell. plastics products	701	2	700	479	221	75	89	40	-	15	2
Other nondurable goods industries	348	0	347	264	84	28	10	33	-	7	6

footnotes at end of table.

Table 43. Median weekly earnings of full-time wage and salary workers 25 years and older by sex and educational attainment, annual averages, selected years 1980-94

Characteristic	1980	1985	1990	1994
TOTAL				
Total, 25 years and over	$286	$379	$450	$500
Less than 4 years of high school	222	270	304	307
4 years of high school, only	266	333	386	421
1 to 3 years of college	304	399	476	498
4 years of college or more	376	506	639	733
Men				
Total, 25 years and over	339	443	514	576
Less than 4 years of high school	267	314	352	342
4 years of high school, only	327	407	460	496
1 to 3 years of college	358	472	544	587
4 years of college or more	427	590	742	826
Women				
Total, 25 years and over	213	296	370	421
Less than 4 years of high school	164	202	341	257
4 years of high school, only	201	268	315	351
1 to 3 years of college	231	317	395	425
4 years of college or more	290	414	536	634

NOTE: Data for 1994 refer to degrees or diplomas received and are not directly comparable with data for prior years which refer to years of school completed.

Table 44. Number of earners in families by type of family, selected years 1980-94

(In thousands)

Characteristic	1980	1985	1990	1994
Total, all families	60,701	64,063	66,623	69,211
Married-couple families	49,316	50,978	52,385	53,246
No earners	5,903	6,693	6,812	7,280
One earner	13,900	12,961	11,748	11,842
Husband	11,621	10,406	9,212	8,745
Wife	1,707	1,897	1,840	2,411
Other family member	573	658	695	687
Two earners	22,446	23,863	26,011	26,957
Husband and wife	19,742	21,315	23,929	24,806
Husband and other family member	2,285	1,961	1,657	1,540
Husband is not an earner	419	587	425	612
Three earners or more	7,067	7,461	7,815	7,168
Husband and wife	5,815	6,472	6,950	6,496
Husband an earner, not wife	1,095	803	716	511
Husband is not an earner	157	186	148	158
Families maintained by women[1]	9,416	10,608	11,309	12,974
No earner	2,216	2,514	2,510	3,111
One earner	4,612	5,043	5,530	6,495
Householder	3,620	3,898	4,468	5,367
Other family member	992	1,146	1,063	1,128
Two earners or more	2,589	3,050	3,268	3,368
Householder and other family member(s)	2,269	2,742	2,903	3,049
Householder is not an earner	320	308	365	319
Families maintained by men[1]	1,969	2,477	2,929	2,992
No earner	244	307	281	332
One earner	891	1,180	1,376	1,615
Householder	726	960	1,127	1,372
Other family member	165	220	249	242
Two earners or more	835	990	1,272	1,045
Householder and other family member(s)	792	941	1,201	983
Householder is not an earner	43	49	72	63

[1] Families maintained by widowed, divorced, separated, or widowed persons.

NOTE: Data on the number and type of families are collected in March of the subsequent year. Earner status refers to the preceding calendar year. Data beginning in 1994 are not directly comparable with data for 1993 and earlier years. For additional information, see "Revisions in the Current Population Survey Effective January 1994," in the February 1994 issue of *Employment and Earnings*, a periodical published monthly by the Bureau of Labor Statistics.

Table 45. Employment Cost Index for benefit costs, 1980-94

Year	Civilian workers	State and local govern-ment workers	Private industry workers: All private industry workers	White-collar workers	Blue-collar workers	Goods-producing workers	Service-producing workers	Manufac-turing workers	Nonman-ufacturing workers
1980	–	–	57.3	56.5	58.6	58.4	56.4	57.8	57.0
1981	–	–	64.7	63.8	66.1	66.2	63.3	65.6	64.1
1982	68.4	–	69.4	68.2	71.3	71.5	67.5	70.7	68.6
1983	74.0	–	75.1	73.7	77.1	77.2	73.2	76.4	74.3
1984	79.3	–	80.3	79.4	81.7	81.8	79.0	81.1	79.8
1985	83.1	–	83.8	83.3	84.5	85.1	82.5	84.6	83.2
1986	86.2	–	86.6	86.4	87.0	87.6	85.7	86.9	86.5
1987	89.2	–	89.3	89.3	89.5	89.8	89.0	88.6	89.9
1988	95.0	–	95.1	94.5	96.0	96.0	94.3	95.3	95.0
1989	100.9	–	100.6	100.6	100.7	100.7	100.6	100.7	100.6
1990	108.0	110.0	107.5	107.8	107.2	107.9	107.2	107.6	107.5
1991	114.4	115.6	114.1	114.4	113.8	114.6	113.7	114.0	114.2
1992	120.5	120.9	120.4	120.2	120.5	121.5	119.5	120.9	120.2
1993	126.7	125.5	127.0	126.3	127.5	129.2	125.1	128.8	125.9
1994	131.5	129.3	132.1	132.1	131.8	134.1	130.3	133.3	131.3

Dash indicates data not available.

table 15

SUMMARY TABLES: Comparing Pre-1979 to Post-1979 Magnitudes and Trends

SIC	INDUSTRY	HRO % Pre /Post	STDIZD	Trade	Skill: %NP	Howell ix	Compuz	NWLC: chamber	nipa	%Un	%
Total mfg											
	DURABLES										
	NONDURBS										
200	FOOD					*					
210	TOBACCO					**					
220	TEXTILES					***					
230	APPAREL										
240	LUMBER										
250	FURNITURE										
260	PAPER										
270	PRINTING										
280	CHEMICALS										
290	PETROLEUM					**					
300	RUBBER										
310	LEATHER										
320	STONE/CLAY/ GLASS			**							
330	PRIM METALS			**							
340	FABRIC METALS			*							
350	MACHINERY					**					
360	ELECTRICAL MACH			**							
370	TRANSP EQPMT			**							
380	INSTRUMNTS					**					
390	MISC MFG			***							

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Work Site & Work Hours: The Labour Force Flexibility of Home-Based Women Workers

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WORK SITE AND WORK HOURS: THE LABOR FORCE FLEXIBILITY OF HOME-BASED WOMEN WORKERS

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The post-war period has seen a steady, almost inexorable, rise in the labor force participation rates of women, from 32.7% in 1948 to 58.9% in 1995 (U.S. President (1996), Table B-35). Nonetheless, women are still largely responsible for the care of family and home. This "second shift" adds about 20 hours to the total weekly work hours of women who are in the labor force, in contrast to just 7 hours for comparable men (Hersch and Stratton (1994)). The multiple responsibilities of employed women translate into a need for greater flexibility in all aspects of the employment arrangement. Indeed, in a recent survey of employees concerning their child and elder care responsibilities, work flexibility was a factor that significantly reduced the stress associated with performing their dual roles of earner and caretaker (Neal, et.al. (1993)).

One way women achieve flexibility is by choosing to work shorter than usual weekly hours (part-time) or fewer than usual weeks per year (part-year). There are a number of papers that focus on women's part-time work and on variations in weeks worked (for example, Blank (1988), (1989), and (1990), Sundt (1989), and Averett and Hotchkiss (1995)). However, there is another important dimension of flexibility in the employment arrangement that has not been extensively explored-- work location. Women have the option of choosing to work at home rather than at another location. In this paper we analyze the determinants of a woman's work site and explore the relationship between her choice of work site and work hours. In particular, we explore how labor force participation, work hours, and work weeks differ between women whose primary place of work is their own home-- home-based workers-- and women who work at an office or other place of business outside of the home-- on-site workers-- using data from the 1990 Public Use Microdata Samples (PUMS) of the Census of Population.

Although there are not at present a large number of people engaged primarily in home-based work, this type of work organization has been on the rise and is likely to continue to increase. Contributing to this trend are the steady improvements in both communication and computing technology, the continued rise in women's labor force participation and in two-career families, and the increased popularity of small business entrepreneurship. Data from the U.S. Censuses of Population show that the declining trend in the number of home-based workers from 1960 to 1980 was reversed in 1990: from 4.7 million in 1960, to 2.2 million in 1980, to 3.4 million in 1990.[1]

An important reason why this type of work organization is attractive to women who desire greater flexibility is that the fixed costs of working, such as the time and out-of-pocket costs of commuting to work, are lower for home-based work than for on-site work. In addition, to the extent that women home-based workers provide their own child-care, the marginal costs of home-based work may also be lower. These factors imply that both the reservation wage and the reservation hours for home-based and on-site work will differ, and also that the responsiveness of women's labor supply to wage changes and to variations in other economic factors will differ between home-based and on-site workers.[2]

In fact, our estimates of the effects of fixed costs on labor force participation, weekly work hours, and annual weeks worked do differ dramatically between home-based and on-site workers. Factors that are associated with the fixed costs of working have a lower deterrent effect (or a stronger positive effect) on home-based labor force participation than on on-site participation. In addition, while factors associated with higher fixed costs of working, such as having small children or being disabled, lowers hours and weeks for both groups of workers, it has a significantly greater effect on home-based hours and weeks, indicating that home-based workers are better able to adapt their work schedules in response to these family circumstances.

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[1] The data for 1960 and 1980 come from Silver (1989), and the data for 1990 come from U.S. Bureau of the Census (1993), Table 18.

[2] One aspect of the choice of home-based work-- that it often involves the simultaneous choice of become self-employed-- is not investigated in this paper, but is treated explicitly in Edwards and Field-Hendrey (1996).

Overall, our results affirm the proposition that home-based work is an attractive and viable alternative for women who need a flexible employment arrangement to overcome their high fixed-costs of labor force entry.

II. <u>How Do Home-Based Women Workers Differ from Others?</u>

Table 1 provides data describing the demographic and socioeconomic characteristics of home-based and on-site women workers and of women out of the labor force computed from the 5% Public Use Microdata Sample (PUMS) of housing units from the 1990 Census of Population of the United States.[3] Included in our analysis are all women aged 25 to 55 years who were either employed or out of the labor force, who did not live in group quarters, who were not in the Armed Forces, and who were not in school.[4] Identification of home-based workers is derived from answers to the journey to work question (No. 23A), which asks, "How did this person usually get to work last week?"[5] Persons who responded to this question that they "worked at home" are regarded as home-based workers. This means that our sample of home-based workers includes only those who worked primarily at home, not those who work mainly on-site but do some work at home. We focus on workers in the prime working years, 25 to 55, so as not to confuse the work site decision with decisions regarding schooling and retirement. The majority of those in the 25 to 55 year age-group will have completed their schooling and will not yet have entered retirement. To obtain approximately equal sample sizes for all three groups, we use all observations of home-based workers from the 5% PUMS, while for women who are on-site workers or who are out of the labor force, we take a .04 subsample of the 5% PUMS,

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[3] The data and sampling procedure are fully described in U.S. Bureau of the Census (1992).

[4] Unemployed women and women with a job but not at work last week are deleted from the sample because there is no way to determine if their desired labor force participation is as a home-based or on-site worker. Finally, we have excluded those women whose class of worker information is not consistent with their reported earnings-- for example, someone who reports herself as self employed in 1990, yet reports wage and salary income for 1989--, and women whose hourly earnings exceed $250.

[5] Persons who used more than one mode of transportation were requested to identify the one used for most of the distance.

yielding a .2% sample of the population of on-site women workers and women out of the labor force.

Home-based women workers differ from on-site workers in critical ways. The two most striking differences are with respect to self-employment and work intensity (hours and weeks worked). Home-based workers are much more likely to be self-employed than are their on-site counterparts: 62.9% of home-based workers are self-employed whereas the corresponding percentage for on-site workers is 3.3. Home-based workers are also much more likely to choose unusual work schedules, both with respect to weekly hours worked and annual weeks worked per year. Although mean hours worked per week differ only by about three hours, the distribution of hours differs dramatically, as can be seen by comparing the distributions of hours worked for on-site and home-based workers shown in Figures 1 and 2. Over 50% of on-site workers worked a standard 40 hour week, while only about a quarter of home-based workers did so. Almost 10% of home-based workers worked "half-time," 20 hours per week. Thus, it is clear from these data that there is a much greater degree of hours flexibility for women who work at home as compared to those who work on-site. This hours flexibility may well be related to the fact that home-based women workers are much more likely to be self-employed and consequently are able to better control their work hours. Home-based workers also exhibit greater flexibility with regard to weeks work per year. For home-based workers, mean weeks worked per year are lower and the variance is greater as compared to on-site workers. Figures 3 and 4 illustrate the greater spread in weeks worked for home based workers. For both on-site and home-based women, 52 weeks per year is the most frequent choice, but only 48% of home-based workers choose 52 weeks, versus 64% of on-site workers. 10% of home-based workers work less than 20 weeks per year, compared to only 5% of on-site workers.

There are several other striking differences between home-based and on-site workers. First, home-based workers are much more likely than on-site workers to have a spouse who is also a home-based worker: 11.3% versus 1.0%. Second, the proportion of home-based workers who live in rural areas is 32.0% whereas for on-site workers the corresponding figure is 23.3%. Further, for home-based workers, about one-fifth of

the rural residents are in farm areas, whereas for on-site workers, this proportion is much smaller, at about 5%. There are also notable differences in the family composition of home-based and on-site workers. Women home-based workers are much more likely to be married with a spouse present than are women on-site workers: 80.4% versus 63.5%.[6] In addition, 29.9% of home-based workers have children under the age of six years and 43.1% have children aged six to seventeen years, compared to 15.1% and 30.0%, respectively, for on-site women workers. Finally, the proportion of disabled women among home-based workers is almost twice as great as among on-site workers, 5.0% versus 2.8%.

There are other differences between home-based and on-site workers that are less dramatic. Home-based workers tend to be somewhat older than on-site workers. Specifically, compared to on-site workers, home-based workers are less likely to be 25 to 34 years old and are more likely to be 45 to 55 years old. With regard to race, blacks are less likely than whites to be represented among home-based workers. Whereas 11.7% of on-site workers are black non-Hispanic, the corresponding proportion of home-based workers is 3.5%. Hispanic and "other race" workers are also slightly less likely than whites to be represented among home-based workers. Thus, while white non-Hispanic workers comprise 78.4% of on-site workers, they comprise 88.4% of home-based workers. Strikingly, there is little difference in the distribution of educational attainment between home-based and on-site workers. However, the family income of home-based workers is about ten percent higher than for on-site workers (possibly because home-based workers are much more likely to be living with a spouse), but both the annual and hourly earnings of home-based workers are below those of on-site workers.

Although our primary interest is to compare home-based and on-site women workers, it is also instructive to compare these two groups with women who are out of the labor force. In some ways, the latter

[6] This may be due in part to the higher proportion of self-employed among the home-based. In studying self-employment among women, Devine (1994) reports that the proportion of married women with spouse present who are self-employed is higher than is the corresponding proportion for women who are either never married or formerly married.

are quite distinct: they have lower levels of educational attainment; they tend to be either older or younger than women in the labor force; they are more likely to be immigrants; they are less likely to be white non-Hispanic; and they are much more likely to be disabled or to have a disabled spouse. However, with regard to family structure, women who are out of the labor force are quite similar to home-based workers: 75.9% of them are married with a spouse present, and they are about as likely to have children as are home-based workers.

In summary, women home-based workers differ from their on-site counterparts in a number of significant ways. First, and perhaps most important, home-based workers are much more likely than on-site workers to be self-employed and to work non-standard hours and weeks. Also, home-based workers are also much more likely to have a spouse who is also a home-based worker, and to live in rural areas. Further, home-based workers are more likely than are on-site workers to be married with a spouse present, to have children under the age of 18 years, and to be disabled. In these latter respects, home-based workers are similar to women who are out of the labor force. The family income of home-based workers is higher than that of on-site workers (whether or not their own earnings are included), though the average hourly earnings of home-based workers are lower. Finally, the representation of non-whites and Hispanics among home-based workers is less than their representation in the labor force at large.[7]

II. Modeling the Labor Force Participation Decision

A. Theoretical Issues

The most important difference between home-based work and on-site work is that the fixed costs associated with working (time costs associated with commuting, out-of-pocket commuting expenditures,

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[7] For a more complete discussion of how home-based and on-site workers differ see Edwards and Field-Hendrey (1995).

clothing costs, and to some extent, the costs of child (or other dependent) care[8]) are greatly reduced for home-based workers[9]. The model developed by Cogan (1981), which focuses on the role of fixed costs in labor force decisions, provides an appropriate starting point. Cogan shows that the existence of time and money fixed costs of working raise the reservation wage compared to what it would be in the absence of these costs. The lower fixed costs of home-based work, therefore, imply that workers will have a lower reservation wage for home-based work than for on-site work.

Applying this model directly to the case of home-based work, however, has one important drawback. The model implies that at any given wage rate, a worker's utility will be higher in home-based work than in on-site work, suggesting that most workers would choose home-based work over on-site work. However, we know from the Census data that most workers are not home-based. The likely explanation for this apparent contradiction is that the demand for home-based workers is low relative to the demand for on-site workers and relative to the supply of people who would like to do home-based work, so that the wage offer for such work, rather than being the same as for on-site work, is substantially below. There are several reasons why employers will make lower wage offers for home-based jobs. First, home-based jobs may simply not be available in certain types of industries-- those that require large amounts of fixed capital or require workers to be on-site, for example. Heavy manufacturing, retail trade, and elementary and secondary schooling are examples. Second, a worker's marginal product may be lower in home-based work because of synergies between workers. Third, a worker's marginal product may be lower at home because of the lack of monitoring or supervision. Finally, employers may simply hold a belief (or suspicion) that a worker's marginal product is lower when she is at home than when she is on site, possibly because of the difficulty in

[8] Child (or other dependent) care costs are not, strictly speaking, a fixed cost of working since they vary with the number of hours worked. The component of these costs attributable to commuting time, however, is a fixed cost.

[9] The hourly cost of dependent care may also vary with work site. This possibility could be incorporated into the model by using a "net" wage rate for each work site, net of the hourly cost of dependent care.

monitoring home-based employees.

Thus, a more appropriate model assumes a lower wage for home-based work than for on-site work, as is illustrated in Diagram I. In this diagram, V represents unearned income, T represents the total time available, M represents the monetary fixed cost of working on-site (e.g. commuting costs), and K represents the time costs of working on-site (e.g. commuting time). The (monetary and time) fixed costs of home-based work are assumed to be zero. W_h and W_o represent the offering wages for home-based and on-site work, respectively, and the budget constraint is ABCD. Depending on the woman's indifference map, she may locate at point A and be out of the labor force, or locate on the segment BC and be a home-based worker, or locate on the segment CD and be an on-site worker. As in the case with Cogan's model, the reservation wage and reservation hours will be lower for home-based work than for on-site work. However, this diagram makes clear the role of fixed costs in the choice between home-based and on-site work: the larger the fixed costs, the further to the left will be the on-site segment of the budget constraint (CD), and the less likely will a person with a given indifference map find it optimal to be on the on-site segment. Similarly, the higher the on-site wage relative to the home-based wage the more likely is one to choose on-site work over home-based work.

To summarize, the implications of this model are as follows. Fixed costs of working are directly related to a worker's reservation wage and reservation hours. Consequently, a worker's reservation wage and reservation hours for work arrangements that require lower fixed costs, like home-based work, will be lower than for arrangements that require higher fixed costs, like on-site work. Thus, factors that increase a woman's fixed costs of working will be positively related to the likelihood that she will be in the labor force as a home-based worker rather than as an on-site worker. We also expect to observe that for women with a given set of socioeconomic characteristics, her choice of hours as a home-based worker will be lower than as an on-site worker. Further, to the extent that home-based women workers, more than half of whom are self-employed, are less likely than on-site workers to be affected by institutional constraints on work hours or work weeks, we expect them to exhibit greater variability in work hours and work weeks.

B. The Econometric Model

The empirical model employed here has four components. The first is a labor force participation equation. The second is a pair of wage equations which predict the "offering wage" a woman can expect in home-based work and in on-site work. The third component is a pair of equations to predict her hours of work, conditional on her choice of labor force state. The last component is a pair of equations predicting weeks worked per year, again conditional on the labor force participation decision. It is assumed that the choice of work site, obtained by maximizing the indirect utility function, is predicated on the woman's having identified the optimal number of work hours in each site.

The empirical model employed here is similar to that used in Hutchens, Jakubson and Schwartz (1989) (hereafter HJS), Blank (1990), and Hill (1989). The three work states from which women are assumed to choose are

State Number	Description
1	Out of the labor force
2	On-site worker
3	Home-based worker

Following HJS, assume a woman's utility function can be written as

(1) $$U = U(C, L, Z)$$

where C is consumption, L is leisure, and Z is a vector of individual characteristics that affect preferences. The woman will choose the state k which maximizes her utility subject to a budget constraint of the form

(2) $$C_k + W_k L_k \leq N + W_k (L^* - L^*_k) - FC_k, \quad k = 1,2,3$$

where W_k is the wage rate, N is nonlabor income, L^* is the time available to divide between work and leisure, L_k is the time spent in work state k, L^*_k is the reduction in available time associated with each state, such as the fixed time costs associated with each type of work, and FC_k represents the monetary fixed costs of working. Like HJS, we have normalized the consumption price to 1. The wage rate W_k will vary with work site for the reasons discussed above. L^*_k and FC_k also vary by work site.

Let T_k = ($\ln W_k$, L^*_k, FC_k). The woman's problem is to choose the state k which maximizes the her indirect utility function, which can be written as

(3) $V_k = V(T_k | Z)$.

This assumes that individual's characteristics, Z, are constant across work states (for example, her nonlabor income, presence of preschool children, race, etc). Again following HJS, we assume that the indirect utility function of individual I can be written as the sum of a deterministic part involving T_k and Z and a stochastic error term, and that the deterministic portion of the function is linear:

(5) $V_{ik} = L_{ik}^{*\prime}\beta_{1k} + FC_{ik}'\beta_{2k} + \ln W_{ik}'\beta_{3k} + Z_i.\alpha_k + u_{ik}$, $k = 1,2,3$.

To estimate equation (5) directly, we would need data on the wage rate in each work state, the fixed costs of working, and the time costs of working. Since direct estimates of the latter two factors are not available, we substitute for them using the following predicting equations:

(6) $L^*_{ik} = X_i'\rho_k + e_{1ik}$

(7) $FC_{ik} = X_i'\theta_k + e_{2ik}$

where X is a vector of predicting variables that includes Z. Substituting these into (5) gives us:

(8) $V_{ik} = \ln W_{ik}'\beta_{3k} + X_i'\gamma_k + v_{ik}$

where $\gamma_k = \alpha_k + \beta_{1k}\rho_k + \beta_{2k}\theta_k$ and α is redefined to include zero coefficients for the variables in X which are not contained in Z.

Further, since we do not have measures of the wage in each labor force state (women are observed in one state only), we predict these wages from estimates of the following equation:

(9) $\ln W_{ik} = Y_i'\delta_k + e_{3ik}$, . $k = 2,3$

where Y represents a vector of variables that may overlap X. Since equation (9) can be estimated only for those women who are actually in the relevant labor force state, the error terms do not satisfy the requirement that their expected value is zero. We adjust for the resulting selectivity bias by including a selectivity

correction factor λ_{ik} as an explanatory variable in equation (9).[10] Equation (9) is estimated with OLS, with the standard errors corrected according to the procedure outlined in Heckman (1979). Using estimates of (9) we predict a home-based and on-site wage for each woman in the sample. We then substitute these predicted wages into (8) to obtain a "structural" labor force participation equation (10),

$$(10) \qquad V_{ik} = \ln W_{ik}^{*}\beta_{3k} + X_i'\gamma_k + v_{ik} \,,$$

where $\ln W_{ik}^{*}$ is the predicted wage for labor force state k.

We estimate the model in equation (10), as well as the reduced form version of that equation (used to estimate λ_{ik}), using multinomial logit (see Maddala (1983)). Note that instruments for all labor force states are included in the equations for each state. In this way, our econometric model resembles what HJS refer to as the "universal logit" model. In the context of our model, this means that the entire set of variables used to predict the fixed costs and the offering wage for both work states enter the logit function for each work state, and a different set of coefficients is estimated (on a common set of variables) for each work state. The resulting estimates of these coefficients are not affected by the nature of the error structure across labor force states.[11] The fundamental assumption required for this approach is that all of the labor force options are in principle available to all participants.[12]

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[10] Our procedure for computing λ_{ik} follows Lee (1983). First we substitute the expression for the wage from (9) into (8) to obtain a reduced form multinomial logit equation predicting labor force status. We obtain the predicted probability of individual I being in labor force state k, P_{ik}, and use it to compute selectivity correction factors for each state, λ_{ik}, by the following procedure:

(a) $H_{ik} = \Phi^{-1}(P_{ik})$

(b) $\lambda_{ik} = \phi(H_{ik}) / \Phi(H_{ik})$

where $\phi(\ )$ and $\Phi(\ )$ are the PDF and CDF of the standard normal distribution.

[11] We are indebted to George Jakubson for this insight. The issue of correlated errors across labor force states was a concern to us because we have reason to believe that non-zero correlations are likely in our context. For example, Gerson and Kraut (1988), in a personality assessment test given to members of their sample of clerical workers, found that home-based workers had statistically significantly different values concerning gender roles and careers as compared to on-site workers. Views on such issues are just the type of unmeasured factor that create correlations in the errors across labor force states.

[12] HJS point out that the major drawback with this model is that it does not meet the condition of allowing one to combine existing estimates with information about a new alternative to make predictions

Finally, we estimate equations to predict hours worked per week and weeks worked per year, conditional on the choice of labor force status. The equation for hours is:

$$(11) \qquad h_{ik} = X_i'\eta_k + \ln W_{ik}^*\zeta_k + \lambda_{ik}\xi_k + e_{4ik}, \ k = 2,3$$

and for weeks,

$$(12) \qquad w_{ik} = X_i'\psi_k + \ln W_{ik}^*\omega_k + \lambda_{ik}\pi_k + e_{5ik}, \ k = 2,3$$

Equations (11) and (12) are estimated with OLS using the relevant predicted wage and including the relevant selectivity correction factor, and the OLS standard errors are appropriately corrected (Heckman (1979)). [13]

III. Explanatory Variables

All of the variables described below are listed in Appendix Table 1with their precise definitions.

A. Choice of Labor Force State

Explanatory variables used in the multinomial logit estimates of the choice of labor force state (equation (10)) are similar to those used in other studies of women's labor supply[14], but are tailored to fit our focus on work site. They include unearned income, a set of variables to represent home productivity and tastes, a set of variables to proxy the fixed cost of working on site, and the predicted wage in each labor force state.

The variables which represent unearned income and home productivity and tastes are as follows. For

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about the probability of choosing that new alternative. This is not a serious drawback in the context of our problem since we do not wish to make inferences about work arrangements other than those already discussed in this paper.

[13] We follow this four step procedure rather than estimating reduced form equations for the whole system jointly using maximum likelihood as Blank (1990) does, in order to obtain explicit estimates of the effect of the on-site and home-based wages on labor force participation, hours, and weeks. This procedure allows us to separate the direct effect on these variables of factors related to fixed costs from the indirect effects that operate through the wage equation.

[14] See, for example, Blank (1988) and (1990), Averett and Hotchkiss (1992 and 1996), Sorensen (1993), and Zabel (1993).

unearned income, we use family income less the earnings of the worker (OTHINC). To proxy differences in home productivity and tastes we include the woman's years of schooling (EDUC), her age (AGE), dummy variables that represent whether she is married with spouse present (MSP), whether she has any children under six at home (CU6), whether she has any children between 6 and 17 at home (C617), whether there is someone over sixty-five in the household (OVER65), whether she is non-Hispanic black (BLACKNH), and whether she is a black or white Hispanic or of another non-white race (HISP&OTH) (the excluded class is non-Hispanic white). One additional measure included to represent a woman's home productivity is her husband's wage (S_WAGE) (if she has a spouse present). The higher the husband's wage (which is a measure of his cost of time), the less likely he will contribute to home production and the higher will be the woman's productivity at home.

The proxy measures that index the fixed costs of working on site include some of the home productivity variables as well as additional measures. The presence of young children in the household (CU6) is associated with a higher fixed cost of working on site. The presence of older children (C617) or persons over sixty-five (OVER65) can be associated with either higher or lower fixed costs depending on whether the older children or older persons in the household require care themselves or are providers of care for young children. While as measures of home productivity these three variables should have the same impact on labor force participation in either work site, to the extent that they represent differences in fixed costs, their coefficients will differ across work sites. Additional fixed cost variables are dummy variables which indicate whether the woman has a disability that limits the kind or amount of work she can perform (DISAB) and whether her husband has a mobility or personal care disability (if she has a spouse present) (S_LIM). Both of these variables will be associated with a higher fixed cost of working on-site than at home. In addition, we include a dummy variable which indicates whether or not the woman lives in a rural (RURAL) or a rural-farm (FARM) locality. Women living in rural or rural farm areas will experience higher fixed costs of working on site because commuting time to work is likely to be greater in these locales than in urban areas.

In addition to the predicted wage, which will be discussed below, there is another aspect of compensation that needs to be included in the labor force participation equations: non-wage compensation. An important difference between home-based and on-site work is that home-based workers-- who are more likely to be part-time and to be self-employed--are less likely to receive fringe benefits as part of their compensation than are on-site workers.[15] However, the value they will place on any fringe benefits received on their job will depend on whether or not they already receive these benefits through a spouse. To hold constant differences in how women value non-wage compensation we include several proxy variables. MSP will partially capture the likelihood that a woman is receiving fringe benefits through her spouse, as will a dummy variable indicating whether or not the husband received any wage and salary income in the previous year (S_EMP). A husband with wage and salary income in the previous year is more likely to have received fringe benefits on the job. In addition, the husband's wage (S_WAGE) will be positively correlated with his probability of receipt of fringe benefits. Finally, a dummy variable indicating whether the spouse is a home-based worker (S_HW) is included because if he is a home-based worker, he is less likely to receive fringe benefits. Alternatively, S_HW may have a positive effect on the woman's choice of home-based work if the couple work together in a home-based business.

The last two variables included in the labor force participation equations are the predicted log of the woman's wage in home-based work (LNWPREDH) and her predicted log wage in on-site work (LNWPREDO), both of which are described in the Appendix. We expect LNWPREDH to have a positive effect on the odds of being a home-based worker and a negative effect on the odds of being an on-site worker, and we expect the opposite relationships for LNWPREDO.

B. The Conditional Hours and Weeks Equations

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[15] In the case of home-based workers, although there is no hard evidence, it has been suggested that these workers are less likely to have employer-provided fringe benefits (Christensen (1985a)). In the case of the self-employed, Devine (1994) documents the much lower proportion of self-employed workers who received health benefits on their jobs, as compared to employees. Blank (1990) documents that part-time workers are much less likely to be included in company pension or health plans.

The conditional hours and weeks equations, which, like the labor force state equation, represent a dimension of labor supply, include most of the same variables as do the structural logit estimates. There are, however, several differences. First, since these equations are conditional on the woman's having chosen the specified work site, the only wage included is the predicted wage for that work site. Second , we include, in addition to these variables, LAMBDAH and LAMBDAO, computed from the reduced form logit estimates of the choice of labor force state (described above), to adjust for the potential selectivity bias. Third, three spouse variables that are most relevant for choosing work site rather than hours are excluded from the hours equation :S_LIM, S_EMP, and S_HW. Finally, to allow for the possibility that the wage/hours and wage/weeks relationships can be positive, negative, or can vary in sign over the range of values of the wage and hours, we include in addition to the predicted log wage variable, a squared term of the predicted wage (LNWPREDO2 or LNWPREDH2).

IV. Results

Estimates of the labor force participation equations, the conditional hours, and the conditional weeks equations appear in Tables 2 and 4, and of the wage equations, in Appendix Table 2. The omitted class for the labor force states is out of the labor force. The coefficients in the labor force participation equations show the impact of a change in the specified variable on the log of the odds of being in the specified labor force state versus being out of the labor force. Because home-based workers are over sampled relative to on-site workers and to those out of the labor force, and because the sampling procedure used in the PUMS is not simple random sampling, we use weights in obtaining all of our estimates.[16]

A. Labor Force Participation Equations

Table 2 shows the logit coefficients for choosing on-site work and home-based work in columns one

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[16] Home-based workers are 25 times more likely to be in our sample than are on-site workers. The Census Bureau provides weights to adjust for the non-random nature of the PUMS sample.

and two, respectively. The results in the first column are very similar to other studies of women's labor force participation (in which estimates are dominated by on-site workers, who greatly outweigh home-based workers): women's on-site labor force participation is positively related to their education and expected wage, and negatively related to their age, their being married with a spouse present, their having children at home, and their having higher unearned income.

Our focus, however, is on showing how women's labor force decisions differ by work site, and the estimates in Table 2 illustrate that these differences are significant, in both a statistical and economic sense. First, there is a significant difference in the set of coefficients in columns 1 and 2; that is, the factors that affect the labor force decision have significantly different impacts on the two work-site choices. Second, the coefficients of most of the individual variables differ significantly across work sites (variables with significantly different coefficients are indicated in the table by the letter a.) As was hypothesized, coefficients of variables associated with the fixed costs of working on site tend to have significantly greater deterrent effects on on-site labor force participation than on home-based labor-force participation. Especially notable are the differences in coefficients for DISAB, CU6, C617 and FARM. The deterrent effect of being disabled on the log odds of on-site labor force participation is almost twice as large as it is for home-based labor force participation. This multiple is greater than two when having children under six is the fixed cost variable. In the case of FARM, C617, and OVER65, the coefficients are negative for on-site work and positive for home-based work (though the difference is not statistically significant for OVER65), again implying a deterrent effect of these variables on participation as an on-site worker relative to participation as a home-based worker. The results for RURAL and S_LIM are not consistent with our hypothesis that factors associated with greater fixed costs of work on-site would tend to reduce labor force participation more for on-site than home-based work. Living in a rural area is associated with an increased (rather than decreased) odds of being in the labor forces as both an on-site and a home-based worker, and the difference in coefficients is not statistically significant. Having a disabled spouse is associated with a reduced odds of being in the labor force in either work site, but

the deterrent effect is significantly greater for home-based work than for on-site work.

Other interesting differences emerge for the roles of other income, marital status, age, race, and education. The negative effect of unearned income on the odds of women's labor force participation is significantly greater for on-site work than for home-based work.[17] This difference suggests that working at home is a preferred to working on-site, and that women use unearned income to "purchase" this preferred work mode. Or, alternatively, working at home might be complementary with time spent in consumption.[18] Put differently, this result suggests that from a utility point of view, time spent working for pay at home is more similar to leisure than is time spent working outside of the home. The deterrent effect of marital status is also significantly less for home-based work than for on-site work.[19] There is also a significant difference in the age coefficient for the two work sites: increased age is more of a deterrent to labor force participation for on-site work than for home-based work. Of the two race variables, only the BLACKNH is has significantly different coefficients for the two work sites. While being black non-Hispanic is not a significant factor in the choice of labor force participation as an on-site worker, black women are significantly less likely than white women to be home-based workers.[20] Interestingly, the education coefficient for the two work sites are not significantly different, though the gradient is higher for on-site work than for home-based work.[21]

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[17] Indeed, when we compute the partial effect of income on the probability of being in the labor force as a home-based worker, this partial effect is positive, whereas the corresponding partial effect for on-site labor force participation is negative.

[18] This result suggests that it might be fruitful to recast our model to allow explicitly for the possibility of complementarities between home-based work and household production and consumption.

[19] As was the case for the unearned income variable, the partial effect of being married with a spouse present on the probability of being in the labor force is positive for home-based work, but negative for on-site work.

[20] A possible explanation is that many home-based workers are self-employed, and it may be more difficult for black women to obtain the necessary capital.

[21] These results are consistent with findings from the 1980 Census reported by Kraut (1988). He studies only non-farm white collar employment and estimates a logistic equation to determine which variables were most important in women's choice of home-based work. He finds that the presence of preschool and older

Of the three variables that reflect aspects of the husband's labor force status, two have statistically different coefficients between the two work sites and one does not. Having a husband who is a home-based worker is a significant deterrent to on-site participation but an encouragement to home-based participation. Clearly the issue of fringe benefits is outweighed by the possible synergies when both spouses are home-based workers, possibly because they are joint participants in the same business. As expected, the husband's wage has a negative effect on the odds of working as either an on-site or a home-based worker, versus being out of the labor force. However, the coefficients are not statitistically different in the two work sites. The results for the husband's receipt of wage and salary income are the opposite of what we would have expected, but perhaps reflect only the fact that this is an imperfect proxy for receipt of fringe benefits.

Finally, we consider the own wage effects on the choice of labor force participation at each work site. Both predicted wage variables are statistically significant in both labor force sites, with the predicted log of the on-site wage (LNWPREDO) being positive and the predicted log of the home-based wage (LNHPREDH) being negative. These coefficients are somewhat paradoxical, however, because they imply that increasing the predicted on-site wage increases the odds of home-based labor force participation more than it does on-site labor force participation, and increasing the predicted home-based wage has a greater negative effect on home-based labor force participation than on on-site labor force participation. These two predicted wages are likely to move together (in fact the correlation between them is .93), but this fact does not provide an explanation for our results. One possibility is that the predicted wage is a poorer instrument for the actual wage received in the case of home-based work than in the case of on-site work: the adjusted R^2 in the equation predicting the

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children, especially for married women, and a work-limiting disability were powerful determinants of the odds of a woman's working at home. Age, education, other household income and residence in rural areas were also significant factors. He also finds that, even after holding these factors constant, black women had a lower probability of working at home than did white women.

home-based wage is .099, as compared to .212 for the on-site wage.[22]

In order to examine the effects of fixed costs on labor force participation more fully, Tables 3A and 3B show the effects on the probabilities of being a home-based or an on-site worker for several prototypical women. Table 3A looks at three women with a high school education and varying marital status and age. Overall, the patterns are quite similar for all three women. With two exceptions (rural location and spousal limitations), changes in the fixed cost variables have opposite effects on the probabilities of being on-site versus being home-based. Increases in fixed costs lower the probability of being on-site and raise the probability of being home-based, as is predicted by our theory. Although the basic probability of being home-based is quite low, between 1 and 2 percent, changes in fixed costs can have a dramatic impact on that probability. For example, for a married twenty-five year old woman, the presence of children between 6 and 17 doubles the probability of being a home-based worker. Table 3B looks at the same women, except that they now have a college rather a high school education. Again, except for rural location and spousal limitations, fixed costs lower the probability of being on-site and raise the probability of being home-based.

B. The Conditional Hours Equations

The first and third columns of Table 4 contain estimates of the conditional hours equations for on-site and home-based workers, respectively. Significant differences in coefficients between work sites in the hours equations are noted with the letters a and c in the table, and significant differences in the weeks equations are noted with the letter b. Factors that had significantly different coefficients in the labor force participation equations, for the most part, also have significantly different coefficients in the hours and weeks equations, but with an important difference. Consider first the conditional hours equation. Whereas the effects of variables that related to family structure had significantly greater deterrent effects for on-site participation than for home-based participation, the direction of the difference changes for hours worked. For example, having a child under six was a much greater deterrent to labor force participation as an on-site worker than as a home-

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[22] See the appendix for further discussion of the wage equation.

based worker, but has a bigger negative effect on hours as a home-based worker than as an on-site worker. The net effect of all the coefficient differences is that predicted hours for home-based work are lower on average than for on-site work (as is suggested by the theory) and are more variable. What this means is that women are better able to adjust their work hours in home-based work than in on-site work. This greater flexibility is most easily demonstrated in Figures 5 through 7. Figure 5 shows predicted weekly hours for on-site workers, predicted alternately from the on-site hours equation and from the home-based hours equation. The predicted distribution if the woman were a home-worker has a wider dispersion; she is more likely to work less than 35 hours per week, or more then 40. Figure 6 shows the same two graphs for home-based workers. Once again the distribution has a wider spread for predicted hours as a home-based worker than as an on-site worker, and has a lower mean. Finally, Figure 7 predicts hours for women who are out of the labor force, using, alternatively, the hours equation for home-based work and for on-site work. Although the means in this case appear similar, the variance is greater for the home-based distribution. In all cases, the greater spread in the home-based distribution indicates that if a woman were home-based, she would be more likely to work nonstandard hours.

C. The Conditional Weeks Equations

Estimates of the two conditional weeks equations appear in the second and fourth columns of Table 4. An important difference between the hours and weeks equations is that the econometric specification used for the weeks equation does not take into account the fact that a large proportion of the observations are clustered at the maximum possible value of the dependent variable, 52 weeks.[23] Thus, the adjusted R^2 is lower for weeks than for hours, and the usual assumptions made with regard to the error term in the equation are not satisfied. Nonetheless, the estimates are still informative. The results for weeks are similar to those for hours, although there are fewer variables with coefficients that differ significantly between work sites. As in

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[23] We plan to reestimate the weeks equation using a specification that takes into account the natural limits in the variable.

the case of the hours equations, the net effect of the differences in the coefficients is to predict that annual weeks worked for home-based workers will be lower than for on-site workers, and that the dispersion of weeks worked will be greater.

Figures 8, 9, and 10 illustrate these differences. These figures show the distribution of predicted weeks worked using the on-site and home-based weeks worked equations, for each of the three labor force classes. In each case, the predicted mean weeks worked is lower for home-based work, and the variability is greater, as compared to on-site work. Just as with hours worked per week, the predictions bear out the theory; if a given woman were to work at home, she would choose to work fewer weeks per year on average, and she would be more likely to choose a "non-standard" arrangement, i.e. less than 52 weeks per year.

V. Conclusions

Home-based work offers women flexibility in work scheduling. The work-at-home option reduces the fixed costs of entering the labor market-- the time and money costs of commuting, the costs of work clothing, and the costs of child care while commuting. The lower fixed costs associated with working at home translate into a lower reservation wage for home-based work, so that women who are likely to have large fixed costs associated with working outside of the home-- women with young children, women with elderly relatives at home, women who are disabled, or women who live in rural areas that may require substantial commutes to an on-site work location-- will be more likely to be in the labor market if they can be home-based workers.

Our estimates are consistent with these hypotheses. When we estimate the odds of being a home-based worker versus an on-site worker, the most important factors to increase the odds of being home-based are the variables that relate to the fixed costs of working-- having children under 6, being disabled, and living in a rural area. Put differently, the discouraging effect on labor force participation of these fixed costs variables are greater for on-site work than for home-based work. In addition, women with higher levels of unearned income were also more likely to choose home-based versus on-site work, confirming that this is the

preferred work option for home-based workers.

Lower fixed costs of working at home are also predicted to result in lower reservation hours and weeks for home-based workers. Again, our estimates are supportive of this hypothesis. Factors associated with higher fixed costs of working on site have relatively larger negative effects on home-based weeks and hours than on on-site weeks and hours. In addition, the distributions of predicted weeks and hours for home-based workers have a greater variance than do the corresponding distributions for on-site workers. It appears that home-based workers are better able to adjust their work schedules to accommodate those family circumstances which generate higher fixed costs of working. On average, home-based workers choose to work somewhat less, and they are more likely to choose nonstandard work schedules.

It is interesting to compare these results from the Census of Population with the views of 24 professional and clerical women in the New York City area who use some type of computer technology in their home-based work (reported in Christensen (1985b)). The advantages of home-based work cited by these workers were the flexibility and autonomy in structuring their work and the financial benefits associated with not going to an office. Strikingly, many of the mothers with young children said that they would not be in the labor force at all if they could not work at home.

Home-based work has its detractors. Many still view this as a form of work organization that causes workers to be exploited and mistreated. Even the women surveyed above cite some disadvantages-- disruption of home and family and inability to get away from one's work, for example. But it is clear from the findings in this paper that home-based work has a valuable place in the menu of work options available to women. Women who otherwise would not be able to enter the labor force-- because of home care responsibilities, inconvenient location, or physical disability-- choose this option. These women are able to adapt their work schedules to a greater degree than are women working on-site. We believe that women's demand for this work arrangement will continue to grow in the future, especially if the current social concern about the welfare of children and families remains strong.

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DIAGRAM I

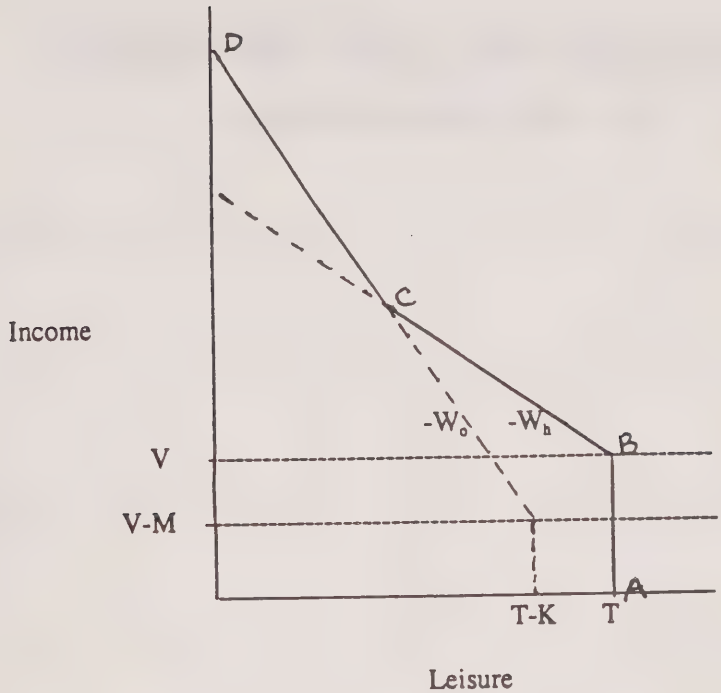
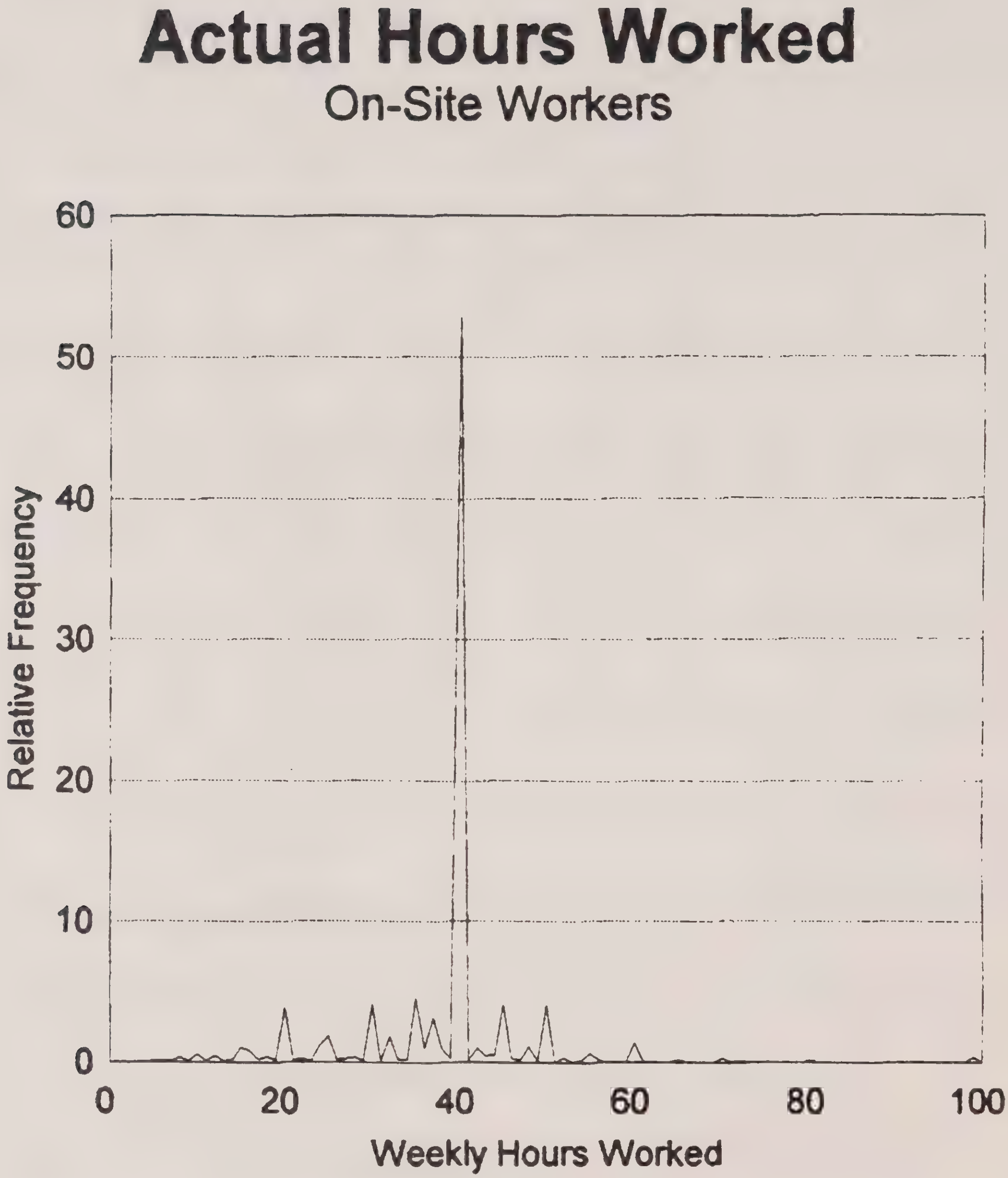


Figure 1



Actual Hours Worked
On-Site Workers
60
50
40
30
20
10
0
Relative Frequency
0
20
40
60
80
100
Weekly Hours Worked

Figure 2

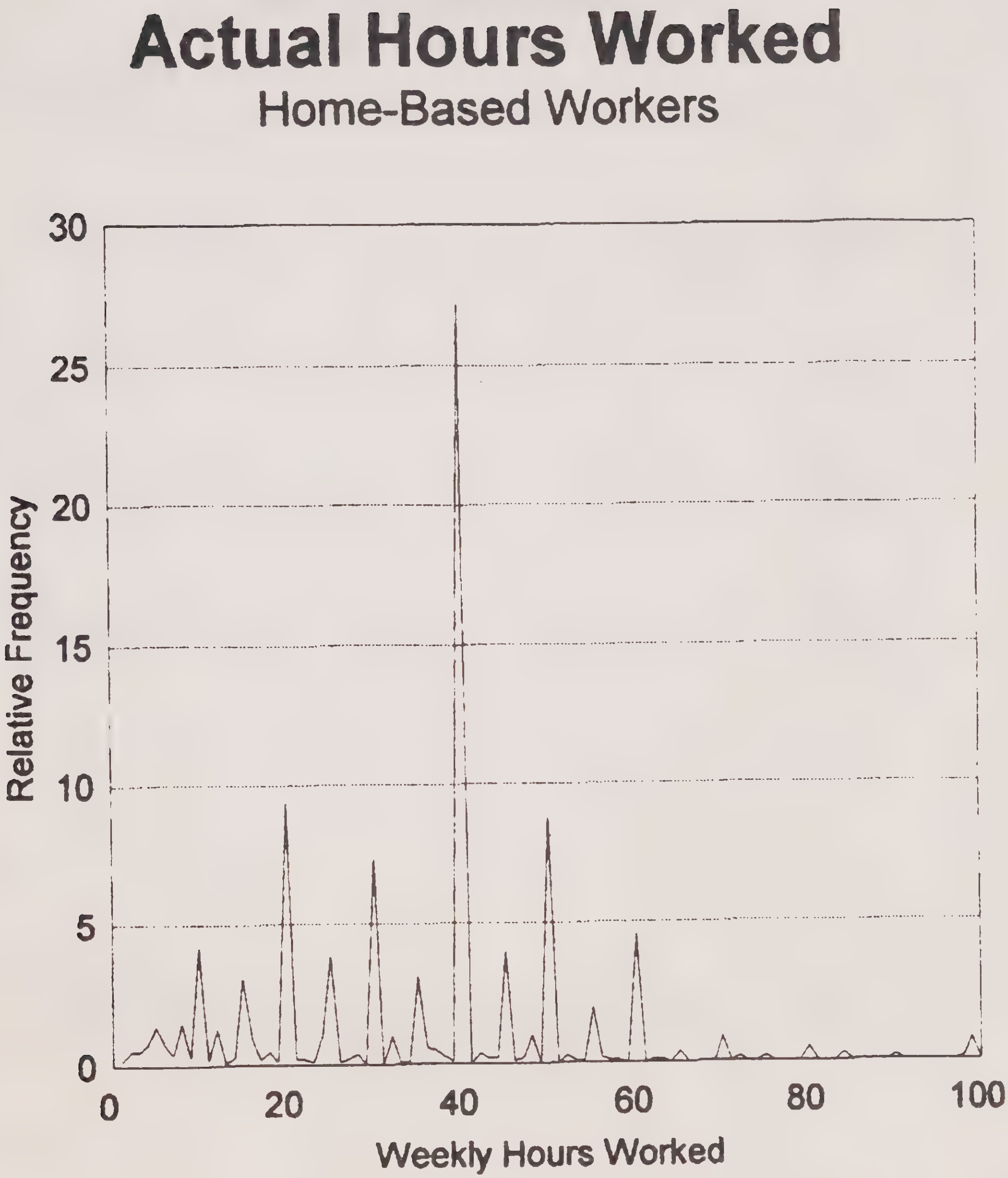

Actual Hours Worked
Home-Based Workers
30
25
20
15
10
5
0
Relative Frequency
0
20
40
60
80
100
Weekly Hours Worked

Figure 3

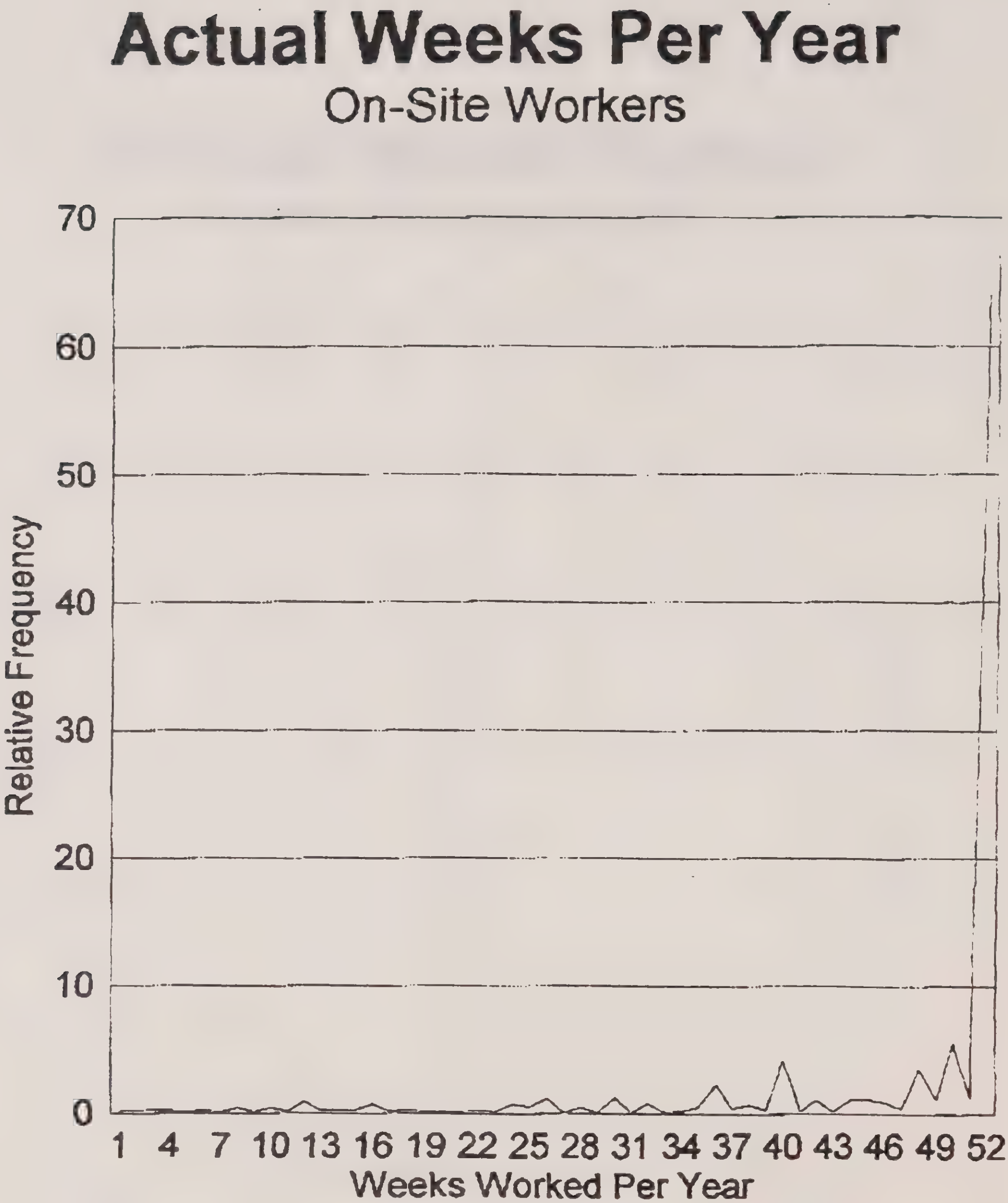
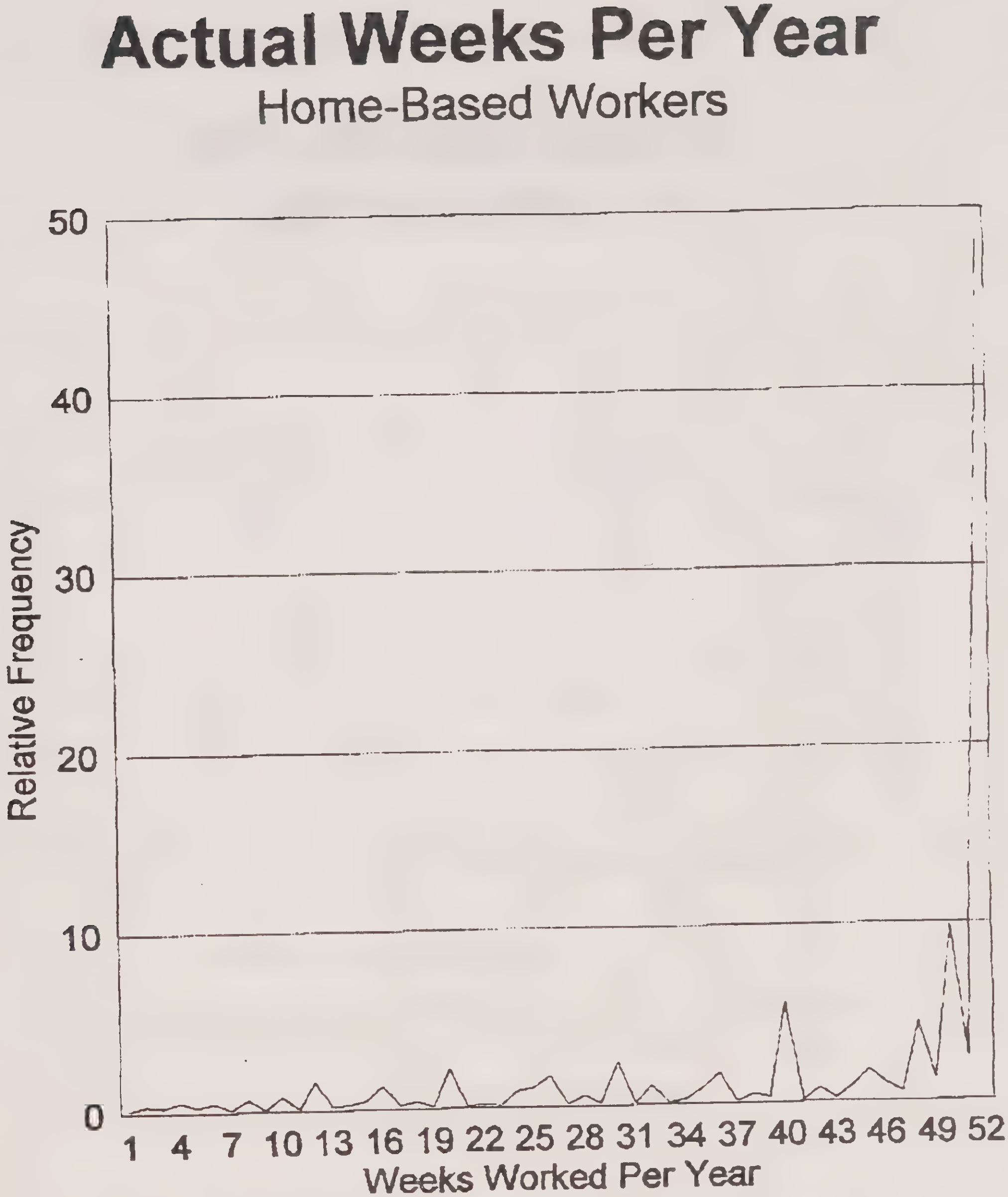

Actual Weeks Per Year
On-Site Workers
70
60
50
40
30
20
10
0
Relative Frequency
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52
Weeks Worked Per Year

Figure 4



Actual Weeks Per Year
Home-Based Workers
50
40
30
20
10
0
Relative Frequency
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52
Weeks Worked Per Year

Figure 5

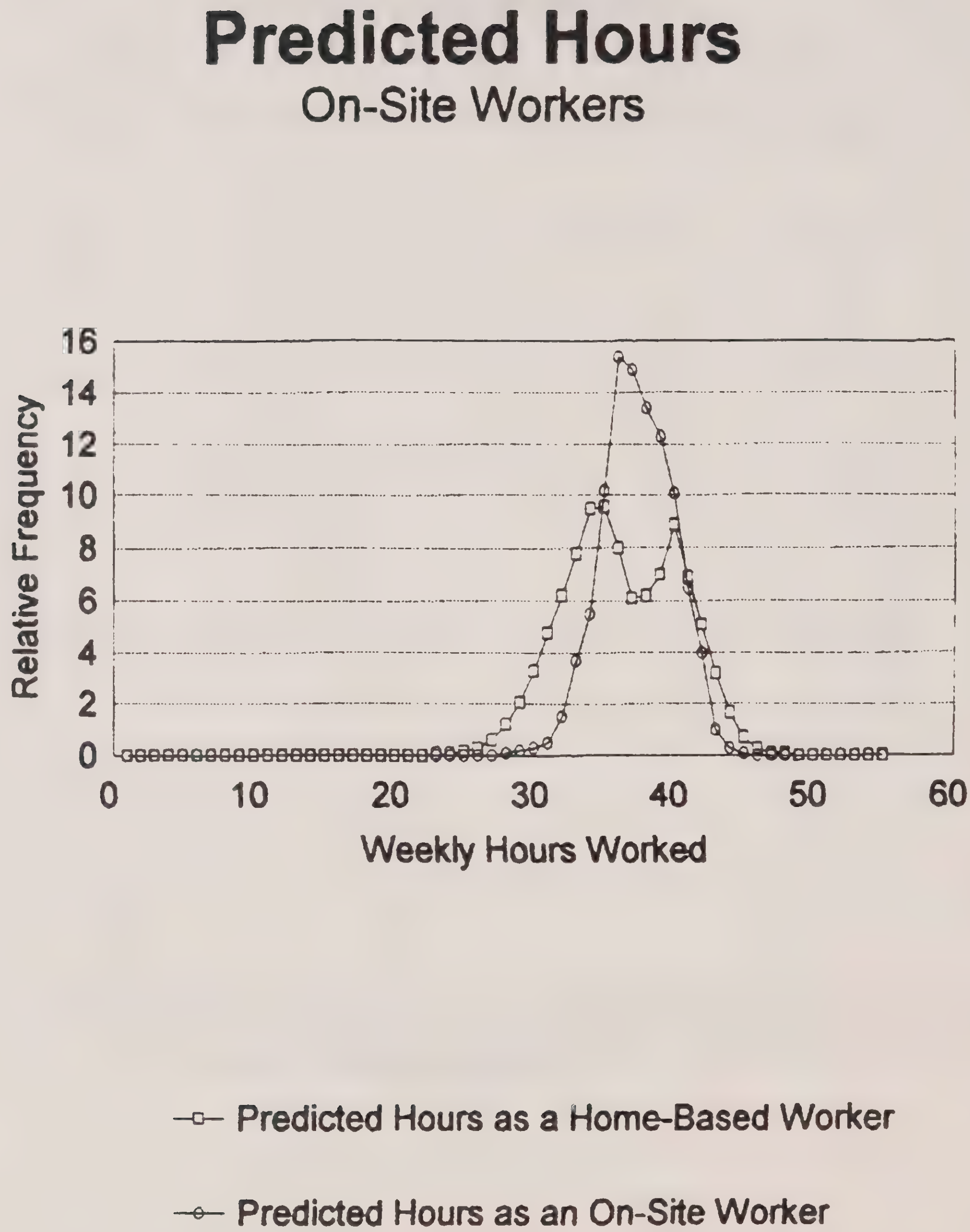
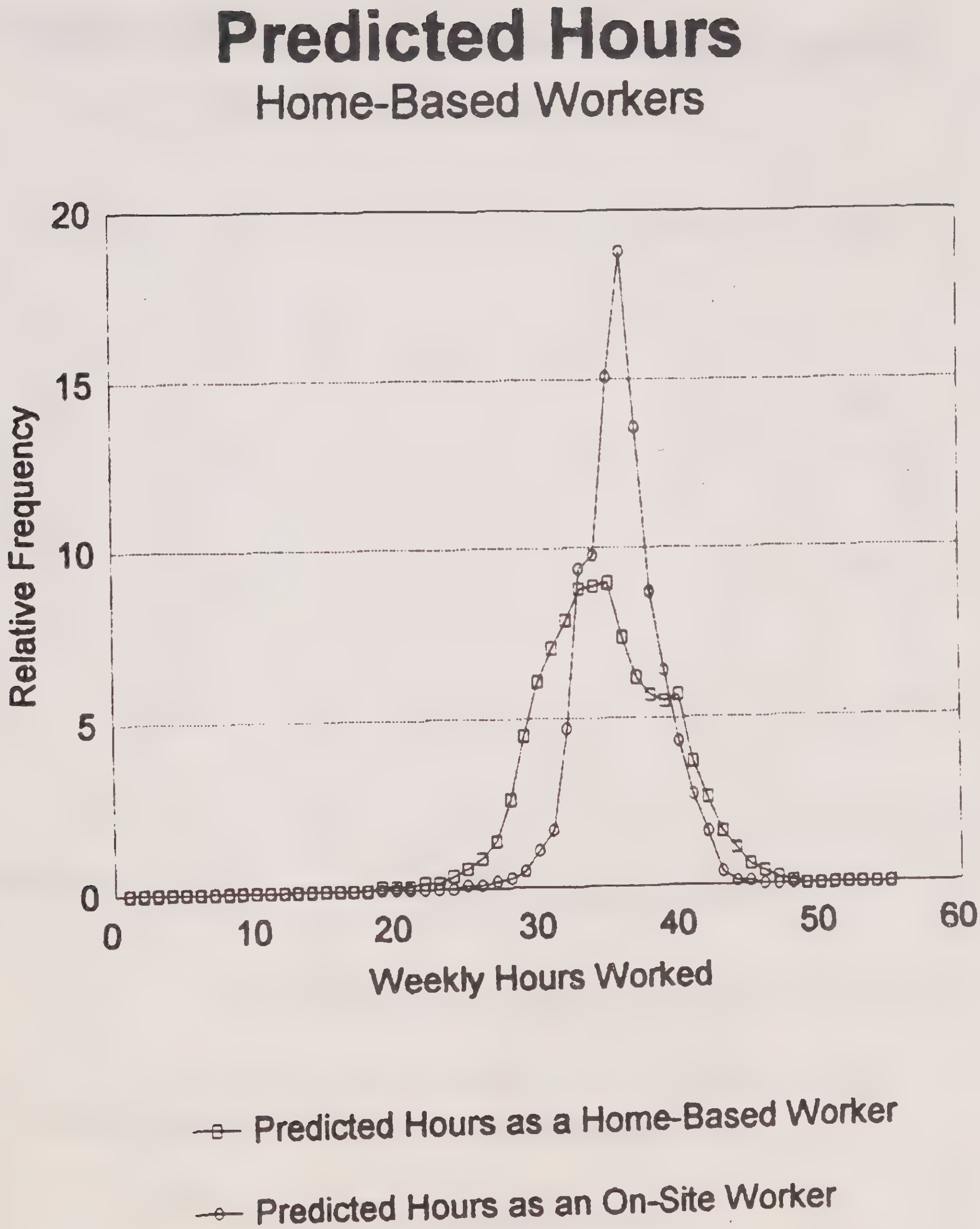
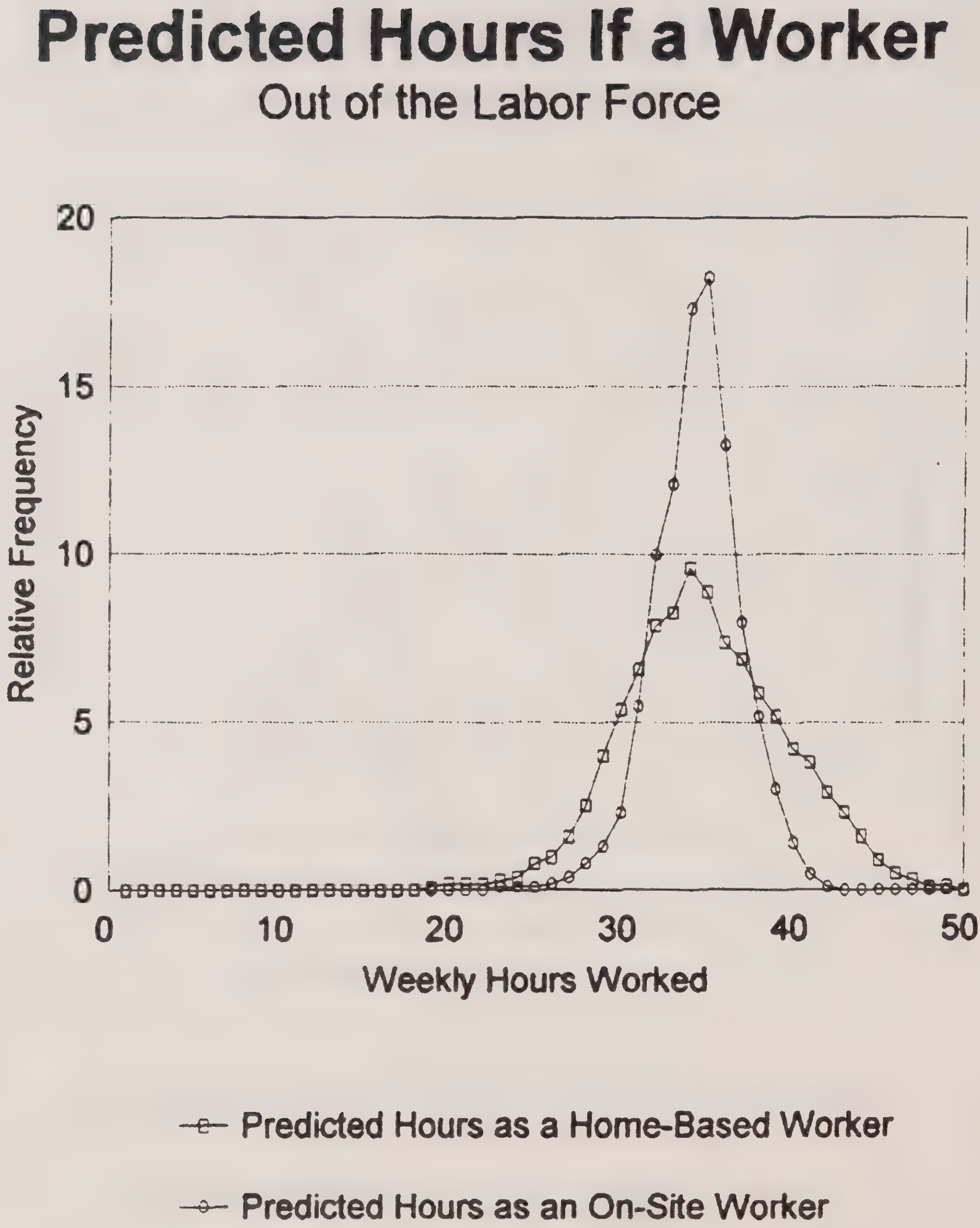

Predicted Hours
On-Site Workers
Relative Frequency
0
2
4
6
8
10
12
14
16
0
10
20
30
40
50
60
Weekly Hours Worked
Predicted Hours as a Home-Based Worker
Predicted Hours as an On-Site Worker

Figure 6



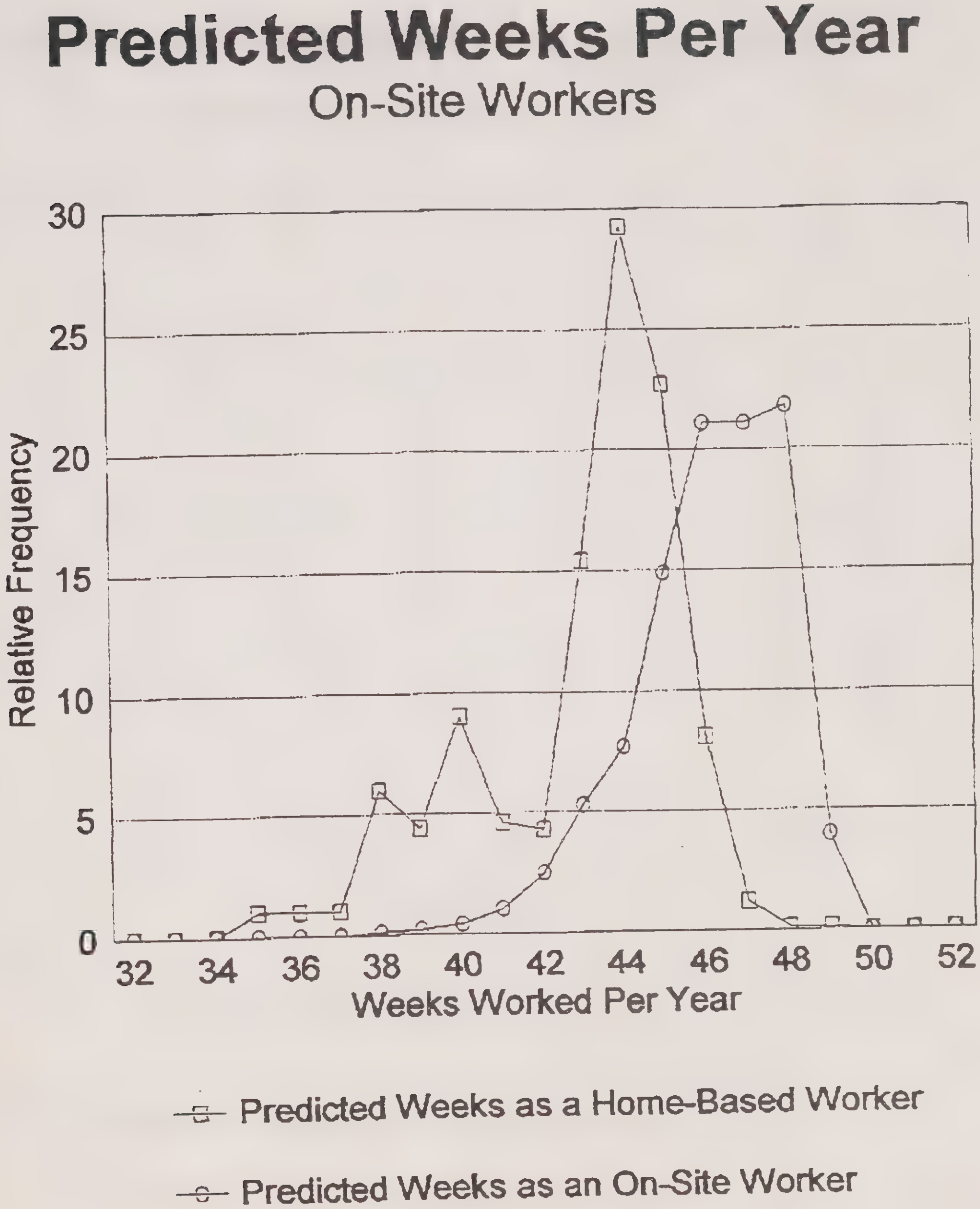
Predicted Hours
Home-Based Workers
20
15
10
5
0
Relative Frequency
0
10
20
30
40
50
60
Weekly Hours Worked
Predicted Hours as a Home-Based Worker
Predicted Hours as an On-Site Worker

Figure 7



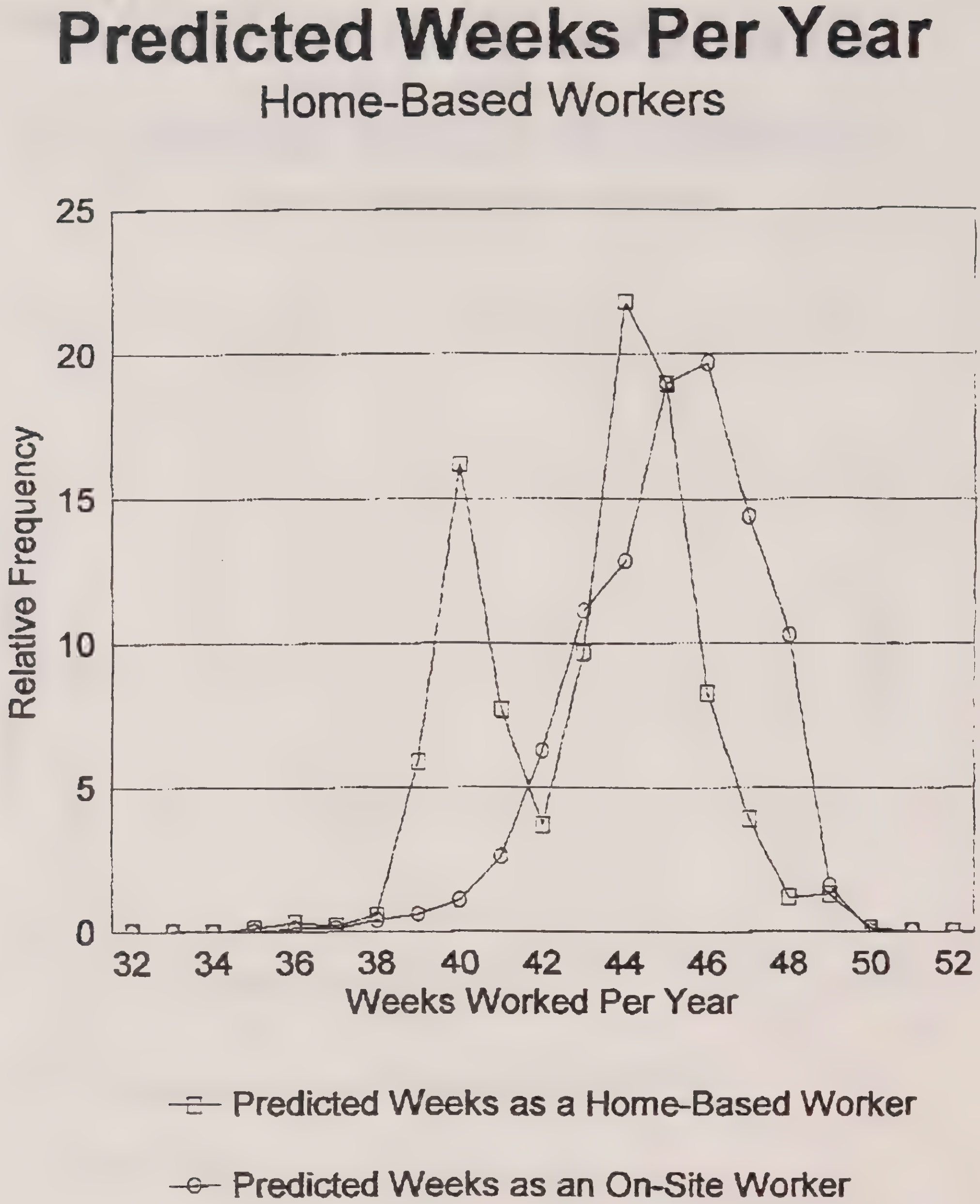
Predicted Hours If a Worker
Out of the Labor Force
20
15
10
5
0
Relative Frequency
0
10
20
30
40
50
Weekly Hours Worked
Predicted Hours as a Home-Based Worker
Predicted Hours as an On-Site Worker

Figure 8



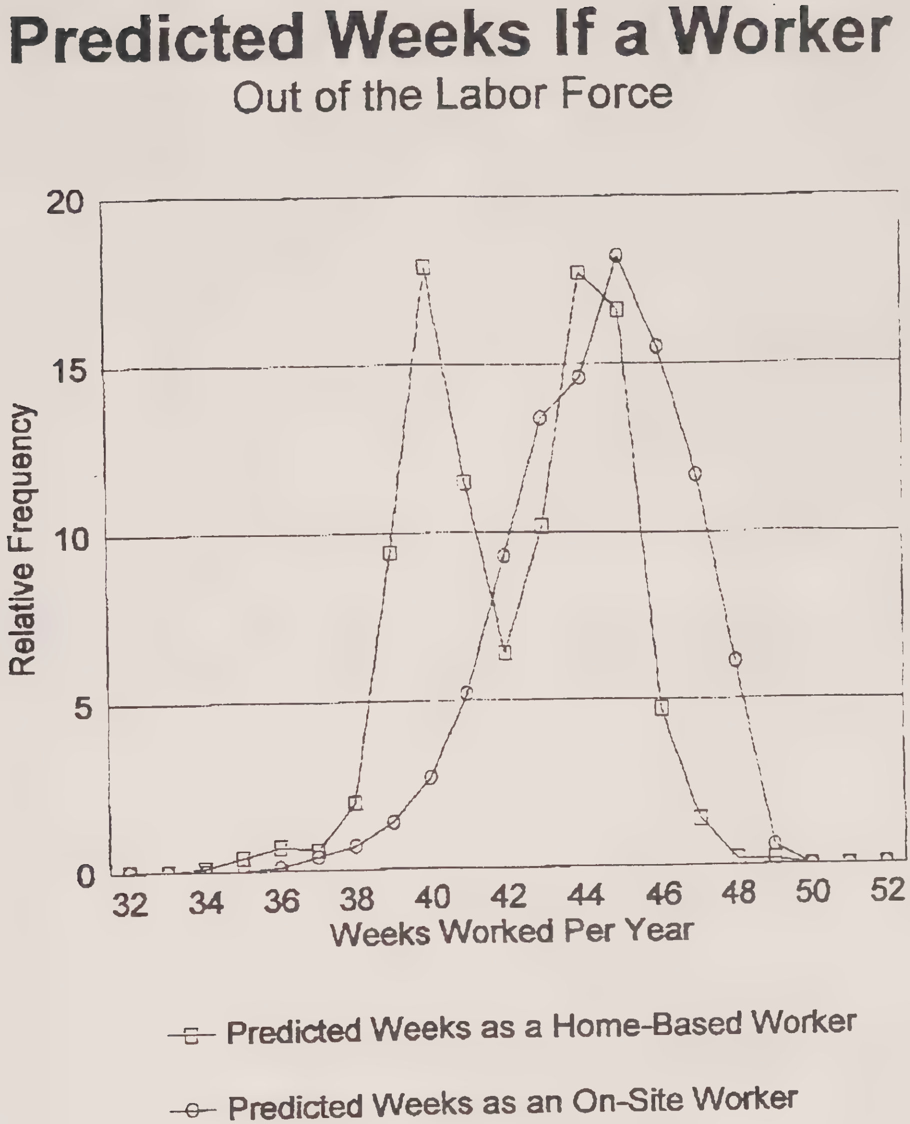
Predicted Weeks Per Year
On-Site Workers
Relative Frequency
0
5
10
15
20
25
30
32
34
36
38
40
42
44
46
48
50
52
Weeks Worked Per Year
Predicted Weeks as a Home-Based Worker
Predicted Weeks as an On-Site Worker

Figure 9



Predicted Weeks Per Year
Home-Based Workers
25
20
15
10
5
0
Relative Frequency
32
34
36
38
40
42
44
46
48
50
52
Weeks Worked Per Year
Predicted Weeks as a Home-Based Worker
Predicted Weeks as an On-Site Worker

Figure 10



Predicted Weeks If a Worker
Out of the Labor Force
20
15
10
5
0
Relative Frequency
32
34
36
38
40
42
44
46
48
50
52
Weeks Worked Per Year
Predicted Weeks as a Home-Based Worker
Predicted Weeks as an On-Site Worker

Table 1. Socioeconomic Characteristics of Women Aged 25-55 years, by Work Status and Work Sit

VARIABLE	Home-Based Workers	On-Site Workers	Out of Labor Force
Number in Sample (percent)	48.181 (100.0)	60,983 (100.0)	25,763 (100.0)
Age Distribution			
25-34 Years	34.5	38.2	38.3
35-44 Years	37.4	36.1	31.2
45-55 Years	28.1	25.7	30.4
Mean Age	39.01 (8.19)	38.25 (8.37)	38.90 (8.95)
Married, Spouse Present	80.4	63.5	75.9
With Children under 6 Years*	29.9	15.1	29.7
With Children 6-17 Years*	43.1	30.0	38.6
Not Married or Married without Spouse Present	19.6	36.5	24.1
With Children under 6 Years*	1.6	2.9	5.2
With Children 6-17 Years*	4.1	8.9	8.6
White, Non-Hispanic	88.4	78.4	73.7
Black, Non-Hispanic	3.5	11.7	11.5
Other Race	2.9	3.6	4.4
Hispanic Origin	5.3	6.3	10.4
Disabled	5.0	2.8	16.5
Urban Residence	68.0	76.7	72.8
Rural Residence	32.0	23.3	27.2
Farm	6.0	1.1	1.6
Non-Farm	26.0	22.2	25.6
Immigrant	8.0	9.3	14.1
Highest Level of Education Completed			
Eighth Grade or less	3.3	2.8	10.0
Some High School	8.3	8.9	19.6
High School Degree	32.9	33.7	36.2
Some College	31.5	30.5	22.0
Bachelor's Degree	17.7	16.1	9.4
More than Bachelor's Degree	4.8	6.1	2.2
Mean Years of Schooling Completed	13.38 (2.46)	13.40 (2.45)	12.01 (3.03)
Presence of Person(s) over 65 in Household	5.0	5.2	6.2

Table 1 (Continued)

VARIABLE	Home-Based Workers	On-Site Workers	Out of Labor Force
Mean Family Income (in dollars)	50,787 (45,623)	46,222 (33,234)	38,804 (39,626)
Self-Employed	62.9	3.3	-
Mean Annual Earnings, 1989 (in dollars)	10,273 (14,234)	18,469 (13,970)	-
Weekly Hours Worked			
Fewer than 35 Hours	42.0	20.8	-
35-45 Hours	36.0	69.2	-
More than 45 Hours	22.1	10.1	-
Mean Hours Worked per Week, 1989	35.12 (17.34)	37.93 (10.52)	-
Mean Weeks Worked, 1989	43.53 (13.23)	46.59 (10.62)	-
Mean Hourly Wage, 1989** (in dollars per hour)	7.91 (13.38)	10.57 (9.03)	-
Spouse is a Home-Based Worker	11.3	1.0	1.6
Spouse Has Mobility or Personal Care Limitations	1.6	2.0	3.5

Notes: ** Computed from annual earnings, weeks, and hours worked for 1989.
Standard deviations are given in parentheses.
The information in this table is computed from the 5% PUMS sample of the 1990 Census of Population and Housing. Workers in group quarters or institutions are excluded, as are those who report themselves as home-based during the Census week, but did not work in 1989. In addition, workers whose earnings information for 1989 was not consistent with their reported class-of-worker status (self-employed v. employee) in 1990 are excluded. The data for home-based workers are from the full 5% sample; the data for on-site workers are based on 0.04 sub-sample of the 5% sample (yielding a 0.002 sample of the on-site worker population).

Table 2. **Structural Logit Coefficients for Labor Force Choice.**

VARIABLE	On-Site Employment	Home-Based Employment
Constant [a]	-1.726 (-17.61)**	-6.720 (-23.22)**
AGE [a]	-0.028 (-28.69)**	-0.009 (- 2.99)**
EDUC	0.084 (16.12)**	0.052 (2.96)**
MSP [a]	-0.759 (-26.19)**	-0.403 (- 4.65)**
CU6 [a]	-1.400 (-75.42)**	-0.524 (- 9.78)**
C617 [a]	-0.234 (-16.50)**	0.021 (0.52)
BLACKNH [a]	0.008 (0.36)	-0.967 (- 8.83)**
HISPOTH	-0.072 (- 3.02)**	-0.214 (- 2.81)**
DISAB [a]	-1.981 (-71.44)**	-1.100 (-11.83)**
RURAL	0.066 (3.76)**	0.129 (2.49)*
FARM [a]	-0.044 (- 0.74)	0.560 (4.85)**
OVER65	-0.094 (- 3.05)**	0.000 (0.00)
OTHINC [a]	-0.014 (-50.87)**	-0.004 (- 2.90)**
S_LIM [a]	-0.123 (- 2.87)**	-0.495 (- 3.12)**
S_HW [a]	-0.327 (- 5.48)**	1.858 (12.06)**
S_WAGE	-0.001 (- 3.94)**	-0.004 (- 0.86)
S_EMPL [a]	0.477 (20.05)**	0.093 (1.42)
LNWPREDO [a]	2.644 (20.95)**	3.607 (9.62)**
LNWPREDH [a]	-0.997 (-11.17)**	-2.036 (- 7.80)**
Log Likelihood	-79,360	

Notes: "t" statistics in parentheses. All logit coefficients refer to the odds of being in the specified labor force category versus being out of the labor force. Estimates are weighted to adjust for choice-based sampling and the non-random nature of the 1990 PUMS. "t" statistics are corrected for the preestimated selectivity correction.

* denotes significance at the 5% level in a two-tailed test

** denotes significance at the 1% level in a two-tailed test

a denotes significant difference in coefficients between work sites at the 5% level

TABLE 3A						
	Woman #1		Woman#2		Woman #3	
	On-Site Worker	Home-Based Worker	On-Site Worker	Home-Based Worker	On-Site Worker	Home-Based Worker
Base Probability of being a:	.894	.010	.887	.012	.777	.017
Percent change in probability due to a change in:						
CU6	-23	+90	-30	+83	-39	+47
C617	-3	+30	-5	+108	-6	+24
DISAB	-38	+60	-45	+33	-57	+6
RURAL	+1	+10	+2	+8	+1	+12
OVER65	-1	+10	-3	+8	-2	+12
S_LIM	N/A	N/A	-1	-33	-2	-29

Woman # 1: Aged 25, high school education, not married with a spouse present, white, urban, no children <17, not disabled, no one> 65 in household. Income and wage variables set at means for non-married women.

Woman #2: Same as woman # 1, except married, spouse present. Wage and income variables set at means for married women.

Woman #3: Same as woman # 2, except aged 40.

TABLE 3B						
	Woman #4		Woman #5		Woman #6	
	On-Site Worker	Home-Based Worker	On-Site Worker	Home-Based Worker	On-Site Worker	Home-Based Worker
Base Probability of being a:	.920	.009	.900	.011	.828	.016
Percent change in probability due to a change in:						
CU6	-18	+100	-22	+91	-33	+63
C617	-2	+33	-3	+27	-4	+25
DISAB	-31	+67	-37	+55	-50	+25
RURAL	+0.4	+11	+0.4	+9	+1	+6
OVER65	-1	+11	-1	+9	-2	+13
S_LIM	N/A	N/A	-1	-27	-2	-31

Woman #4: Same as woman #1 in Table 3A, except college education.

Woman #5: Same as woman #2 in Table 3A, except college education.

Woman #6: Same as woman #3 in Table 3A, except college education.

Table 4. **Estimates of Weeks and Hours Supplied, Conditional on Labor Force Participation.**

VARIABLE	On-Site Employment		Home-Based Employment	
	Weekly Hours Worked	Annual Weeks Worked	Weekly Hours Worked	Annual Weeks Worked
Constant [a,b]	51.615 (26.86)**	30.674 (15.56)**	76.109 (47.08)**	47.212 (37.81)**
AGE [a,b]	-0.050 (- 8.04)**	0.026 (4.04)**	-0.107 (- 8.90)**	0.074 (7.98)**
EDUC [a]	0.263 (7.20)**	- 0.240 (- 6.41)**	-0.308 (- 6.35)**	- 0.195 (- 5.20)**
MSP [a,b]	-0.928 (- 8.67)**	- 0.126 (- 1.15)	-4.583 (-18.80)**	- 0.897 (- 4.76)**
CU6 [a,b]	-2.784 (-14.36)**	- 1.155 (- 5.82)**	-5.505 (-25.60)**	- 3.650 (-21.95)**
C617 [a,b]	-1.946 (-21.52)**	- 1.375 (-14.81)**	-1.284 (- 7.61)**	- 0.190 (- 1.46)
BLACKNH [a]	0.887 (6.27)**	- 0.355 (- 2.44)*	3.866 (8.04)**	0.239 (0.64)
HISPOTH	1.754 (11.88)**	- 0.503 (- 3.32)**	1.775 (5.62)**	- 0.980 (- 4.01)**
DISAB [a,b]	-2.308 (- 5.89)**	- 0.581 (- 1.46)	-3.746 (- 9.87)**	- 3.370 (-11.47)**
RURAL [a]	-0.066 (- 0.63)	- 0.292 (- 2.73)**	-1.029 (- 5.38)**	0.035 (0.24)
FARM [a,b]	-0.336 (- 0.92)	0.559 (1.50)	1.336 (3.34)**	1.787 (5.80)**
OVER65	0.207 (1.11)	- 0.584 (- 3.03)**	0.770 (2.10)*	0.046 (0.16)
OTHINC [a]	-0.037 (-16.43)**	- 0.009 (- 3.77)**	-0.051 (-25.10)**	- 0.007 (- 4.10)**
S_WAGE	-0.006 (- 2.55)*	0.001 (0.09)	-0.008 (- 4.72)**	- 0.002 (- 1.94)
LNWPREDO [c]	-11.806 (- 7.02)**	17.947 (10.39)**	-	-
LNWPRDO2 [c]	2.798 (7.77)**	- 3.750 (-10.13)**	-	-
LNWPREDH [c]	-	-	-15.202 (-10.34)**	3.172 (2.79)**
LNWPRDH2 [c]	-	-	3.840 (8.63)**	- 0.566 (- 1.64)
LAMBDA [a,b]	-0.863 (- 2.00)*	- 3.693 (- 8.40)**	-4.541 (-15.24)**	- 2.188 (- 9.54)**
Adjusted R-squared	0.05964	0.02871	0.06784	0.03592

Notes: "t" statistics in parentheses. Estimates are weighted to adjust for choice-based sampling and the non-random nature of the 1990 PUMS. "t" statistics are corrected for the preestimated selectivity correction.
* denotes significance at the 5% level in a two-tailed test
** denotes significance at the 1% level in a two-tailed test
a denotes significant difference in coefficients between work sites in the hours worked equations, at the 5% level
b denotes significant difference in coefficients between work sites in the weeks worked equations, at the 5% level
c denotes significant difference in coefficients between work sites of corresponding wage variables in the hours worked equations, at the 5% level

Appendix Table 1

Variable Definitions

Variable	Definition
AGE	Age
AGE2	Age squared
EDUC	Years of Schooling[a]
EDUC2	Years of Schooling squared
AGEEDUC	Age times Years of Schooling
OTHINC	Total Family Income - Earned Income of Individual (in thousands of dollars)
MSP	Dummy variable which equals 1 if woman is married with spouse present
FERT	Number of children
CU6	Dummy variable which equals 1 if one or more children under 6 years old is present in the household
C617	Dummy variable which equals 1 if one or more children between 6 and 17 years is present in the household
BLACKNH	Dummy variable which equals 1 if woman is black, non-Hispanic
HISP&OTH	Dummy variable which equals 1 if woman is Hispanic, Asian or other non-white race
DISAB	Dummy variable which equals 1 if woman has a disability which restricts the kind or amount of work she can do
RURAL	Dummy variable which equals 1 if woman lives in a rural area
FARM	Dummy variable which equals 1 if woman lives in a rural farm area
OVER65	Dummy variable which equals 1 if there are person(s) over 65 years old in the household
S_HW	Dummy variable which equals 1 if the woman's spouse is a home-based worker
S_LIM	Dummy variable which equals 1 if the woman's spouse has a mobility or personal care limitation
S_WAGE	Spouse's average hourly earnings computed from 1989 annual earnings, weeks worked in 1989, and hours worked in the Census week
S_EMPL	Dummy variable which equals 1 if the woman's spouse reported wage and salary income in 1989
LNWPREDO	Log of predicted hourly earnings in on-site work
LNWPRDO2	Square of LNWPREDO
LNWPREDH	Log of predicted hourly earnings in home-based work
LNWPRDH2	Square of LNWPREDH
MW	Dummy variable which equals 1 if the woman lives in the Midwest
SOUTH	Dummy variable which equals 1 if the woman lives in the south
WEST	Dummy variable which equals 1 if the woman lives int the west
MFGWAGE[b]	Average hourly earnings in 1989 of production workers in manufacturing in the state
UNEMP[c]	Unemployment rate in the state in 1990

Appendix Table I, continued

Industrial distribution of employment in 1990 by state (agriculture is excluded industry)[c]:

FORESTRY	Percentage of employment forestry and fisheries
MINING	Percentage of employment in mining
CONSTRUC	Percentage of employment in construction
MFG	Percentage of employment in manufacturing
TRANS	Percentage of employment in transportation,communications and other public utilities
WHLESALE	Percentage of employment in wholesale trade
RETAIL	Percentage of employment in retail trade
FINANCE	Percentage of employment in finance, insurance, and real estate
SERVICES	Percentage of employment in services
PUBADMIN	Percentage of employment in public administration

All variables taken from the 1990 PUMS unless otherwise indicated.

[a] This variable was coded as a continuous variable from the classes provided in the Census.

[b] Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, January 1991, Table C-8.

[c] Source: U.S. Bureau of the Census, 1990 Census of Population, Social and Economic Characteristics (1990 CP-2-1), (Washington, D.C.: USGPO, 1993), Tables 149 and 151.

Appendix Table 2. **Reduced Form Logit Coefficients for Labor Force Choice.**

VARIABLE	On-Site Workers	Home-Based Workers
Constant	0.004 (0.01)	-5.046 (- 3.11)**
AGE	0.136 (14.33)**	0.195 (6.60)**
AGE2	-0.002 (-15.40)**	-0.002 (- 6.82)**
EDUC	0.027 (1.56)	0.021 (0.36)
EDUC2	0.009 (19.35)**	0.008 (5.54)**
AGEEDUC	-0.001 (- 3.31)	-0.001 (- 1.06)
MSP	-0.628 (-23.26)**	-0.163 (- 1.97)*
CU6	-1.157 (-61.86)**	-0.334 (- 6.27)**
C617	-0.176 (-10.66)**	-0.036 (- 0.74)
FERT	-0.143 (-26.03)**	-0.037 (- 2.22)*
BLACKNH	-0.034 (- 1.48)	-1.024 (- 9.32)**
HISP&OTH	-0.159 (- 6.67)**	-0.475 (- 6.18)**
DISAB	-2.200 (-78.93)**	-1.253 (-13.60)**
RURAL	-0.098 (- 5.76)**	0.069 (1.39)
FARM	-0.153 (- 2.58)*	0.501 (4.44)**
OVER65	-0.117 (- 3.81)**	0.024 (0.25)
OTHINC	-0.012 (-43.94)**	-0.002 (- 1.24)
S_LIM	-0.066 (- 1.51)	-0.384 (- 2.42)*
S_HW	-0.362 (- 6.00)**	1.696 (19.58)**
S_WAGE	-0.001 (- 3.34)**	-0.003 (- 0.75)
S_EMPL	0.412 (17.13)**	0.039 (0.60)
MW	0.142 (4.55)**	0.308 (3.48)**
SOUTH	0.087 (2.24)*	0.119 (0.10)
WEST	-0.076 (- 2.35)*	0.273 (2.94)**
MFGWAGE	-0.016 (- 1.51)	-0.032 (- 1.09)
UNEMP	-0.129 (-12.72)**	-0.173 (- 6.05)**
FORESTRY	0.207 (4.99)**	0.294 (2.64)**
MINING	-0.005 (- 0.34)	0.047 (1.02)
CONSTRUC	0.004 (0.27)	-0.050 (- 1.24)
MFG	-0.008 (- 1.41)	-0.178 (- 1.20)
TRANS	-0.079 (- 6.07)**	-0.180 (- 4.90)**
WHLESALE	0.034 (1.42)	0.151 (2.17)*
RETAIL	-0.032 (- 3.13)**	-0.027 (- 0.96)
FINANCE	-0.007 (- 0.60)	-0.001 (- 0.04)

Appendix Table 2. (Continued)

VARIABLE	On-Site Workers	Home-Based Workers
SERVICES	0.014 (1.71)	0.019 (0.93)
PUBADMIN	-0.018 (- 1.78)	0.033 (1.25)

Notes: "t" statistics in parentheses. All logit coefficients refer to the odds of being in the specified labor force category versus being out of the labor force. Estimates are weighted to adjust for choice-based sampling and the non-random nature of the 1990 PUMS.
* denotes significance at the 5% level in a two-tailed test
** denotes significance at the 1% level in a two-tailed test

Appendix Table 3. **Equations to Predict the Hourly Earnings of On-Site and Home-Based Workers.**

VARIABLE	On-Site work	Home-Based work
Constant	-0.286 (- 1.42)	-0.626 (- 1.46)
AGE	0.051 (15.81)**	0.060 (8.27)**
AGE2	-0.001 (-14.91)**	-0.001 (- 5.77)**
EDUC	-0.026 (- 4.24)**	-0.030 (- 2.11)*
EDUC2 [a]	0.005 (30.42)**	0.006 (15.89)**
AGEEDUC [a]	-0.0001 (- 0.93)	-0.001 (- 4.09)**
MSP [a]	-0.021 (- 3.81)**	-0.134 (- 9.30)**
FERT [a]	-0.052 (-25.81)**	-0.063 (-16.99)**
BLACKNH [a]	-0.163 (- 2.06)*	0.094 (3.00)**
HISP&OTH [a]	-0.082 (- 9.87)**	-0.003 (- 0.13)
DISAB [a]	-0.284 (-16.63)**	-0.173 (- 7.18)**
RURAL [a]	-0.093 (-17.46)**	-0.127 (-10.75)**
FARM [a]	-0.102 (- 5.18)**	-0.214 (- 8.61)**
MW [a]	-0.063 (- 6.12)**	-0.147 (- 6.24)**
SOUTH	-0.063 (- 4.95)**	-0.044 (- 1.60)
WEST	-0.014 (- 1.27)	-0.040 (- 1.86)
MFGWAGE	0.030 (8.30)**	0.023 (2.89)**
UNEMP [a]	0.0001 (0.03)	0.050 (6.83)**
FORESTRY	0.002 (0.13)	0.026 (0.90)
MINING	-0.012 (- 2.20)*	-0.029 (- 2.52)*
CONSTRUC [a]	0.043 (9.26)**	0.079 (7.94)**
MFG	0.007 (3.51)**	0.007 (1.91)
TRANS	-0.007 (- 1.62)	0.006 (0.66)
WHLESALE	0.025 (3.14)**	0.010 (0.58)
RETAIL	-0.024 (- 6.90)**	-0.032 (- 4.21)**
FINANCE [a]	0.040 (10.02)**	0.069 (7.76)**
SERVICES	0.006 (2.27)*	0.003 (0.43)
PUBADMIN	0.009 (2.78)**	-0.003 (- 0.38)
LAMBDA [a]	0.194 (13.20)**	-0.201 (-10.35)**
Adjusted R-squared	0.21187	0.09872

Notes: "t" statistics in parentheses. Estimates are weighted to adjust for choice-based sampling and the non-random nature of the 1990 PUMS. "t" statistics are corrected for the preestimated selectivity correction.
* denotes significance at the 5% level in a two-tailed test
** denotes significance at the 1% level in a two-tailed test
a denotes significant difference in coefficients between work sites at the 5% level

Appendix

The Log Wage Equations

Variables to predict the woman's offering wage in on-site and home-based work are similar to those used by others (see, for example, Blank (1990), Averett and Hotchkiss (1992 and 1996), Neumark and Korenman (1994)): age (AGE) , age squared (AGE2), education (EDUC), education squared (EDUC2), an age and education interaction term (AGEEDUC), marital status (MSP), number of children (FERT), race (BLACKNH and HISP&OTH), location of residence (RURAL and FARM),[1] whether the woman is disabled (DISAB), variables representing the region of the country (SOUTH, WEST, MW), the manufacturing wage in the state (MFGWAGE), and the unemployment rate in the state (UNEMP). In addition, we include a set of variables to capture the industrial distribution of employment in the state (their definitions are self-evident). We indicated that the offering wage for home-based work is likely to be lower than for on-site work because certain industries are unsuited to home-based work. We expect that the greater the proportion of employment in each state is such industries, the lower will be the predicted wage for home-based relative to on-site work. An additional reason for lower wages for home-based work might be a compensating differential for the lower utility of women working away from home.

Included, in addition to these variables, are LAMBDAH and LAMBDAO, computed from the reduced form logit estimates of the choice of labor force state (described earlier), and included to adjust for the potential selectivity bias associated with estimating a wage equation in a particular labor force state using data only for women in that state.

The estimated wage equations are found in Appendix Table 2. In many respects the log wage

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[1] One might expect offering wages to be lower in rural areas, at least for on-site work. However, to the extent that one industry that readily lends itself to home-based work, farming, is more prevalent in rural and rural/farm areas, it may be that the offering wage for home-based work will be relatively higher in such areas. Therefore, we include variables representing both residence in a rural area (RURAL) and residence in a rural/farm area (FARM).

equations for the two work sites are quite similar. The coefficients of age, age squared, education, and education squared indicate that the payoff to education and experience are very similar in both work sites with one difference: for older women with high levels of education is there smaller payoff to age and education for home-based work than for on-site work. The woman's fertility, the location of her residence in a rural area and in certain geographic regions, and the state's manufacturing wage are also not significantly different across work sites.

However, there are notable differences. First, married women take a much larger wage reduction as home-based workers than as on-site workers. Whereas MSP women earn approximately 2% less than women who are not MSP in on-site work, for home-based work they earn about 13% less. Women living in farm areas also earn relatively lower wages as home-based workers than as on-site workers: 21% less than those in non-FARM areas for home-based work versus 10% less for on-site work. Both of these differences may reflect a compensating differentials if MSP women and women living in FARM locales obtain relatively greater utility from home-based work as compared with their non-MSP and non-FARM counterparts. On the other hand, being disabled has a much smaller negative effect on earning as a home-based worker than as an on-site worker: approximately 17% versus 28%. And finally, being a minority is not associated with a lower wage for home-based workers as it is for on-site workers. Indeed, black non-Hispanic women earn about 9% more than their white counterparts in home-based work. To the extent that the race difference in hourly earnings for on-site work is partially a result of discrimination, the fact that more than half of home-based workers are self-employed may provide an explanation for this difference: women who face discrimination in the labor market may be able to mitigate its effects if they become self-employed. The difference in the self-employment rates between home-based and on-site workers may also explain the difference in the coefficients of the state unemployment rate. The latter variable is not significantly related to hourly earnings for on-site work, but is positively and significantly related to hourly earnings of home-based workers. A possible explanation is that the more able among the

unemployed may shift to home-based self-employment in areas where unemployment is relatively high. Finally, the industrial distribution of employment across states, which is included to account for differences in demand for home-based workers that arise because of differences in the types of industries found in these states, have coefficients that differ significantly in some cases but not in others. For example, in states with a higher share of employment in state and local government, women's earnings are higher in on-site work, but not in home-based work. Or, in the case of retail trade, the reduction in earnings associated with a greater proportion of employment in retail trade is greater for home-based earnings than for on-site earnings.

There are three other important ways in which the earnings equations for on-site and home-based work differ. First, the coefficient of the selectivity adjustment term is positive for on-site work and negative for home-based work (both coefficients are statistically significant). Since the sign of the coefficient is the sign of the correlation between the errors in the reduced form logit equation and the wage equation, these results can be interpreted as follows. People whose unmeasured characteristics make them more likely to choose on-site work also are likely to have higher hourly earnings (given their measured characteristics). In contrast, people whose unmeasured characteristics make them more likely to choose home-based work are likely to have lower earnings (given their unmeasured characteristics). Second, the proportion of observations for which earnings are allocated by the Census Bureau, rather than being reported directly by the woman, is greater for home-based than for on-site workers.[2] Thus, the hourly earnings figure is reported with more error for home-based workers than for on-site workers. This error is compounded by the fact that home-based workers are much more likely than on-site workers to be self-

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[2] For home-based women in our sample the proportion for which 1989 information is allocated is as follows: 16% have their hours of work allocated, 11% have their wage and salary income allocated, 11% have their non-farm self-employment income allocated, and 9% have their farm self-employment income allocated. For on-site women, the corresponding proportions are 12%,11%,6%, and 6%, respectively. Lilliard, Smith and Welch (1986) report that Census allocation procedures tend to understate income, especially in professional occupations. Thus, the greater proportion of observations allocated for home-based workers suggests that their earnings are more likely to be understated than will be those of on-site workers.

employed and the earnings of the self-employed are notorious for errors in reporting (Devine (1992)). The fact that earnings are measured with so much more error for home-based workers is at least a partial explanation for the third difference. The adjusted R^2 is much smaller for the home-based earnings equation than it is for the on-site earnings equation: .099 versus .212. Thus, when we use the predicted earnings variables as instruments for the actual earnings in each work site, as we do in the labor supply equations, predicted home-based hourly earnings is an inferior instrument compared with predicted on-site hourly earnings.[3]

Overall, while the effects of education, age, and fertility on earnings are quite similar for on-site and home-based work, there are substantial differences in the effects of other variables. The net effect is to make the predicted hourly earnings for home-based work about 60% of the predicted hourly earnings for on-site work.[4] The other important difference is that the earning equations are estimated with greater accuracy for on-site work than for home-based work, a factor that is important when the resulting predicted hourly earnings are used as instrumental variables in the labor supply equations.

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[3] Bound, Jaeger, and Baker (1995) show that if there is a low correlation between an endogenous variable and a potential instrument, even a small correlation between the instrument and the error in the basic equation being estimated can produce a larger inconsistency in the IV estimates than in the OLS estimates.

[4] The is computed as the difference in the (antilog of the) means (over the entire sample of women) of the predicted logs of home-based and on-site hourly earnings.